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Report No. CG-C-1-77

A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY BE EFFECTIVELY APPLIED TO THE ACCOMPLISHMENT OF COAST GUARD VESSEL OPERATIONAL TRAINING

AD No.
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April 30, 1977

FINAL TECHNICAL REPORT

Document is available to the public through the
National Technical Information Service,
Springfield, Virginia 22161

Prepared for

U.S. DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD
Office of Chief of Staff
Washington, D.C. 20590

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Applied Digital Communications
214 West Main Street
Moorestown, New Jersey 08057

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15. Supplementary Notes

A baseline of present operational training methods and costs are developed. Present training methods are examined for adequacy by means of questionaires

16. Abstract

A baseline of present operational training methods and costs are developed. Present training methods are examined for adequacy by means of questionaires and interviews. Simulator configuations are presented which could be directly substituted for existing training methods. Throughout the measure of prorated cost/hands on hour of training is utilized for comparison. Appendices provide: A. Implementation plan for simulation training systems; B. Catalog of simulator hardware and techniques; C. Development of simulator configurations for cost comparison; D. Data reduction and analysis of survey questionaire; and E. Operational training cost analysis.

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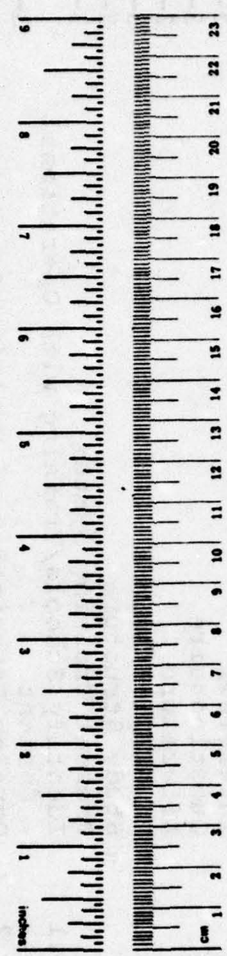
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

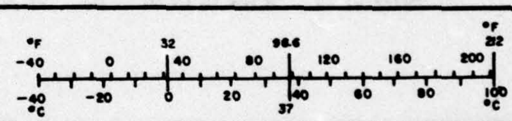
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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SECTION 1

INTRODUCTION

1.0 INTRODUCTION

This report presents the results of a nine-month study by Applied Digital Communications to assist the U. S. Coast Guard in evaluating the potential of employing simulators for operational training.

1.1 STUDY SCOPE

The study was to determine those areas in which vessel simulation may be effectively applied to the accomplishment of Coast Guard vessel operational training. In order to make that determination, the present Coast Guard operational training was reviewed to establish a cost for hands-on student training per hour. Simulator configurations were developed to provide equivalent training, and their cost was generated for comparison.

The study generated a recommended follow-on plan for the U. S. Coast Guard to pursue and a cost benefit analysis was performed, based on that follow-on plan. The cost benefit analysis for that follow-on plan demonstrated that:

- Simulators for operational training are beneficial
- 378 ship operating time for training would be reduced
- Additional personnel would be available as a result of the improvements
- Substantial reduction in fuel consumption would result

with the potential to:

- Increase the 378 ship and personnel benefits 2:1 by the end of the 1980's and to provide ship days for the 210 as well.

The review of the present training system demonstrated:

- The desirability of simulator training
- Shortcomings in the present training system
- Inefficiencies to be reduced

The study was conducted with the following premises dictated by the contract:

(1) Cost of energy will remain a major consideration.

(2) Present level of enlisted and officer turnover will continue.

(3) Ships' officers will continue to be drawn from a wide variety of specialties and backgrounds.

(4) The level of training provided over the last ten years was the minimum adequate for the safety of vessels, performance assignment of missions, and providing sea service background to administrative elements in maritime areas.

The specific attention of the study was directed to simulators for large cutter operational training with simulators with consideration also given to simulators for the Academy, small boats, future ships (270) and research applications.

1.2 ORGANIZATION OF THE REPORT

The report contains five sections, plus five Appendices for supporting information. Section 2 summarizes the study and presents the major recommendations. Section 3 describes the organization of the study effort and the methods used to gather data providing the foundation for the analysis. Section 4 provides the data to support the recommendations. Section 5 presents the results and conclusions derived in the study. The Appendices are: A - Implementation Plan for Simulation Training Systems; B - Catalog of Simulator Hardware and Techniques; C - Development of Simulator Configurations for Cost Comparison; D - Data Reduction and Analysis of Survey Questionnaire; and E - Operational Training Cost Analysis.

SECTION 2

EXECUTIVE SUMMARY AND RECOMMENDATIONS

2.0 INTRODUCTION

The executive summary provides a response to the Statement of Work and summarizes the recommendations. In addition to the recommendations on the implementation of simulators to provide more cost-effective operational training, several organization and procedural changes have been noted. These changes would result in a more effective, efficient and flexible training system regardless of the incorporation of the simulators. There is a clear need for the U. S. Coast Guard to incorporate simulator training into a comprehensive training system organized by ship type, ship mission and personnel assignment, as indicated by the cost-benefit analysis.

2.1 RESPONSE TO STUDY PURPOSE

Statement of Purpose: "To determine those areas in which vessel simulation may be effectively applied to the accomplishment of Coast Guard vessel operational training."

The cost analysis comparing the cost per student hands-on hour of training for the present system versus equivalent training in a simulator demonstrated a clear need to employ simulators for operational training in the U. S. Coast Guard. This was done to determine where a simulator training approach would be more cost effective than the present training approach. Where there was direct correlation between the training provided and the simulator training, the simulator approach was always better by a large margin.

The detailed analysis for the implementation of a ship simulator in a shore site training facility represents a substantial cost benefit to the U. S. Coast Guard. The analysis of the WHEC 378 provides an implementation which can be amortized by the saving in the first year of operation. With that large a benefit, the implementation of a ship simulator for the 270 or the 210 should be considered as soon as their implementation or usable life can be established.

2.1.1 General Considerations

The analysis of the present training system was somewhat hampered by the inability to find a clear "pipeline" training approach correlated to the mission requirements of the U. S. Coast Guard. The results from the questionnaire demonstrated the need for expanded training in many mission areas. A clear recommendation from the study must be that the U. S. Coast Guard:

(1) Establish the requirements for training by mission

(2) Determine an approach to meet those needs by mission and ship type.

(3) Establish a training system implementing (1) and (2).

(4) Continue to measure the effectiveness of the training system to meet the needs.

(5) Continue to implement more efficient training operations both with and without simulators.

2.2 RESPONSE TO "KEY QUESTIONS"

The basic Statement of Work for this contract outlined a sequence of key questions to be answered in the study. Although many of these questions require some qualification on the answers depending on further analysis, they can be answered as follows:

2.2.1 What specific types of simulation would be useful for vessel operation training?

ADC recommends the procurement of a land-based ship simulator developed in a time-phased program built up in a modular fashion with 20 subsystem simulators for training of key members of the WHEC (378) crew. The subsystem simulators can be interconnected to form the twenty-first configuration for exercises involving all the key ship crew members.

ADC additionally recommends a trailerable ship simulator for training of the crew of the small boats. This recommendation assumes consistent results in further analysis on the needs, training scenarios and final simulator specifications.

ADC recommends the development of a ship simulator as a part of the training for the new COMDAC crews on the 270 as the system is implemented. This assumes that a consistent evaluation of the training, as was done for the 378, can be applied to the training for the 270 when equipment, crew, and missions are completely defined.

ADC recommends the procurement of a Radar Navigation simulator for the Academy based on the capability to provide adequate student utilization by expanding the Nautical Science courses.

ADC recommends further evaluation be undertaken to expand the 378 simulator for training on other ship types such as the WMEC 210.

2.2.2 Have changes in simulator technology, client technology, or changing environmental factors made simulation a cost-effective method of accomplishing vessel operational training and research? What will simulation of various types cost in terms of both direct and indirect costs? Provide cost, capability, and application information for basic packages and modular add-ons.

The basic simulator costs have been developed using 1977 estimates for procurement of devices. The development efforts underway by simulator manufacturers could lead to lower actual costs when procurements are actually made as a result of their development efforts. The costs of ship simulators are continuously improving as a result of the development of visual displays, and software for computerized simulation systems.

2.2.3 If training of operators appears to be a fruitful area for applications, what savings in terms of energy usage, vessel operating time, capital investment, and training time can be realized by providing simulators for various classes of vessels?

The results of the analysis of the present WHEC (378) cutter training system for these factors is summarized in Table 2-1, based upon the following modification to the present training system.

- Full implementation of the 378 ship simulator
- One month attendance prior to ship assignment, at the ship simulator school for 120 of the crew members of each 378 in a two-year period
- Training availability will not use the ship for a hotel
- Reduction of REFTRA time as a result of the ship simulator school
- Reduction of ASW exercises as a result of the ship simulator school
- Increased efficiency in training afloat allowing reduced crew as a result of the ship simulator school
- Reduced U. S. Coast Guard instructors supplied to REFTRA due to reduced participation
- Reduced U. S. Coast Guard liaison at the Navy sites
- Reduced U. S. Coast Guard Assignment of personnel to Navy due to reduced participation in training

TABLE 2-1. CUTTER TRAINING SYSTEM COST/BENEFIT FACTORS

TRAINING APPROACH	Energy Usage Fuel Cost in $ for Annual Use: Present Training System Usage	Energy Usage Fuel Cost in $ for Annual Use: New System Usage with Simulators	Vessel Operating Time in Ship Days: Present Training System Usage	Vessel Operating Time in Ship Days: New System Usage with Simulators	Capitol Investment Single Investment: Present Training System	Capitol Investment Single Investment: New System Usage with Simulators	Training Time in Man Days: Present Training System	Training Time in Man Days: New System Usage with Simulators
Training Availability (Go individually)	21,672	-0-	168	-0-		2,292,000*	25,872**	6,468
REFTRA - 50% Reduction	82,560	41,280	336	168			51,744**	25,872**
ASW - 50% Reduction	715,248	357,624	228	114			38,532**	19,266**
Training Afloat	--	--	--	--			73,180**	41,980**
Summer Cruise	104,705	--	255	--			39,270**	--
Training System Generation						4,100,000		
Simulator Building						2,500,000		
Net Present Worth Maintain						4,108,000*		
Simulator Acquire						6,379,000		
Trainee at Simulator School								15,867
Instructor Simulator School (Officer)								5,160
REFTRA (Instructors Officers)							8,320	4,160
Navy Liaison							1,820	780
Personnel Assigned to Navy--Compensate for Schools							15,340	9,620
TOTALS	$921,185	$398,904	987	282		$19,379,000	254,078	129,173
NET BENEFITS	Annual Fuel Saving $522,281		Annual Saving Ship Days 705 Ship Days 3.92 Operating Ship years				Annual Man Days Available 101,266 man days 662 Ship Man Years (180 days)	
NET COSTS						$19,379,000		

* Based on net present worth of annualized cost (non-billet). Capital recovery factor 6.145 for ten years at 10 percent rate of return.
** Ship Man Days

2.2.3.1 What other operational costs/savings should be considered?

These two key areas should be considered further: first should be the expansion of the ship simulator for training other ship crews, particularly the 210, but other ships should also be considered; and, second, the simulator could also be used to evaluate crew task analysis to determine how to more efficiently use the crew/equipment resulting in crew reductions and/or improved operation efficiencies.

2.2.3.2 Which operators should be trained?

The WHEC 378 simulator training program trains 120 members of the crew with approximately half trained each year as a result of the rotation policies.

2.2.3.3 What degree of simulation is most advantageous--high, low, or mix?

The study goal, to provide training equivalent to that which is presently received led to the generation of the ship simulator for 378 training. The ship simulator represents what we consider as a flexible mid-level fidelity simulator. The definition which we use for three levels of simulation is as follows:

Low Fidelity:	Procedures trainer - may be a mock-up of the facility with minimum electronic stimulation of sensors and indicators.
Medium Fidelity:	Subfunction or mission simulator replicating the facility physical attributes with correlated sensor/indicator stimulation to provide inputs for decisions by the operators.
High Fidelity:	Simulation which replicates the real world indications with adequate fidelity to provide operator training.

The medium fidelity simulator configurations selected have the flexibility to be expanded to provide high fidelity at greater cost (probably 2 or 3 times) or to be reduced to low fidelity for the final implementation. This type of fidelity to match the training needs while still providing full mission training is a key feature of the simulation approach shown for analysis and later implementation. The final implementation of the ship simulator will be selected as a result of subsequent detailed study and analysis.

2.2.3.4 Where should these facilities be located or should they be mobile?

Both are recommended depending on the need. Final site selection for the WHEC 378 ship simulator has not been established and should be selected based on the most cost-effective location.

2.2.3.5 <u>Recommend Coast Guard's future course with regard to training simulators.</u>

The training plan recommends implementation out to 1986 and a training feedback system to continually evaluate needs. We recommend further implementation of simulators be considered when the simulator training capability can be directly correlated with training needs, within a pipeline training system. Further analysis of this type training for other ships and missions should be undertaken since large benefits have been indicated for the 378 implementation.

2.2.4 <u>Can one simulator economically serve a variety of purposes?</u>

The use of ship simulators for several ship types has been demonstrated in other ship simulator applications and should be economical. When the training system for each major ship type is analyzed dependent upon the personnel, equipment and missions for that ship, the modifications of or acquisition of the simulator should economically meet the training needs as they have for the 378.

2.2.5 <u>If otherwise viewed as advantageous, what will be the impact of increased use of Coast Guard owned simulators on vessel deployment, training time, and personnel policies?</u>

The use of simulators for training results in increased operational use of ships and crews, reduced training time and the availability of some personnel. Final implementation requires actions from other U. S. Coast Guard groups to bring about these advantages.

2.2.6 <u>If adopted, will Coast Guard simulators affect any external economies or diseconomies in the Navy, MarAd or other agencies?</u>

There will be reduced use of Navy training facilities and training approaches resulting in fewer personnel being assigned to the Navy.

2.3 RECOMMENDATIONS

This section restates the recommendations presented in the succeeding sections of the report. The number in parentheses at the end of each recommendation refers to the section where the recommendation is made.

(1) The Coast Guard should review the capability of the Academy to provide the professional training and the academic training within four years. (4.2.2) Efforts should be undertaken to get greater utilization of the present Academy facilities and planned future facilities.

(2) The Coast Guard should initiate the effort to send a questionnaire to the units and small boat officers to measure the effectiveness of their present training providing support for the small boat trailerable simulator. (4.2.3)

(3) The Coast Guard should pursue the development of the training requirements for the COMDAC system for the operation and maintenance personnel considering that the operational training will be accomplished with the aid of simulators. (2.2.4)

(4) The Coast Guard should look at the present training system to find the shortcomings in the training program and determine methods to most effectively fill those needs. (3.4.3.1)(4.4.1)(5.0)

(5) The Coast Guard should look at the potential of further data reduction of the data base from the questionnaire to provide insight into how to reorganize the training program to get more training for the dollars spent with or without the use of simulators. (3.4.3.1)(4.6.3)(5.0)

(6) The USCG should look at the potential of ship simulators for training for each of the other major ship types in their inventory. These probably would represent additions to the 378 ship simulator as opposed to complete independent simulator facilities. (4.6.7)

(7) The U. S. Coast Guard should look at the potential of an at-sea training exercise (like REFTRA) conducted by a mobile team for USCG related operations. This would be a part of the training feedback system to increase and maintain readiness in the service. This approach could also be used to further reduce the REFTRA cost since bringing the instructors to the ship costs substantially less than bringing the ship to the instructors. (4.3.2)(5.0)

(8) The USCG should consider expanding the ship simulator scenarios to cover procedures for fire control and damage control and potentially investigate using "realistic" planned Navy simulators to complete the training efforts. (4.6.6)

(9) Training Availability should not utilize the ship to provide a "hotel" for that training. This should be accomplished by pre-assignment to ship simulator training and pre-assignment training of personnel sent to Navy schools as required. (4.3.2)

(10) The cadet summer cruise should be eliminated as a single entity using dedicated cutters and be replaced by ship simulator time and assignment on operating cutters. (4.3.2)(4.6.7)

(11) REFTRA should be reduced 50 percent and be replaced by ship simulator time. (4.3.2)

(12) ASW training should be reduced 50 percent and be replaced by ship simulator time. (4.3.2)

(13) Personnel assigned to the Navy to support the cost for Navy training should be reduced as those training efforts are undertaken by the ship simulator. (4.3.2)

SECTION 3

STUDY METHODOLOGY

3.0 METHODS

This section shall describe the organization, methodology, structure, data collection, data base generation and analysis used in the study. Much of the detail for the data bases used are contained in the Appendices of this report.

3.1 ORGANIZATION

The ADC study team consisted of four members, two full time and two part time, and utilized a consultant from Applied Psychological Services, Inc. The two full-time team members each took prime responsibility for a major task:

(1) To evaluate present training methods for cost comparison

(2) To develop simulator approaches to training for cost comparison

The part-time members aided in the data collection and data reduction. Applied Psychological Services provided support in the generation of the questionnaire and evaluation of the training systems. For the U. S. Coast Guard, G-OMR had direct cognizance over the study effort; however, valuable support was provided by Operations, Personnel, Engineering and the Academy. ADC should also point out that as a result of the four seminars conducted during the course of the study effort, many industrial and government personnel participated in providing valuable insights.

3.2 STUDY METHODOLOGY

The study methodology is shown in Figure 3-1 and represents an iterative process used during the study to analyze 78 simulator configurations with 505 different training scenarios.

This process was used to evaluate five different operational training areas which were candidates for simulator training:

Operational Simulator for the 378

Operational Simulator for the 210

Simulator Training for COMDAC-270

Small Boat Handling Simulator

Radar/Navigation for the Academy

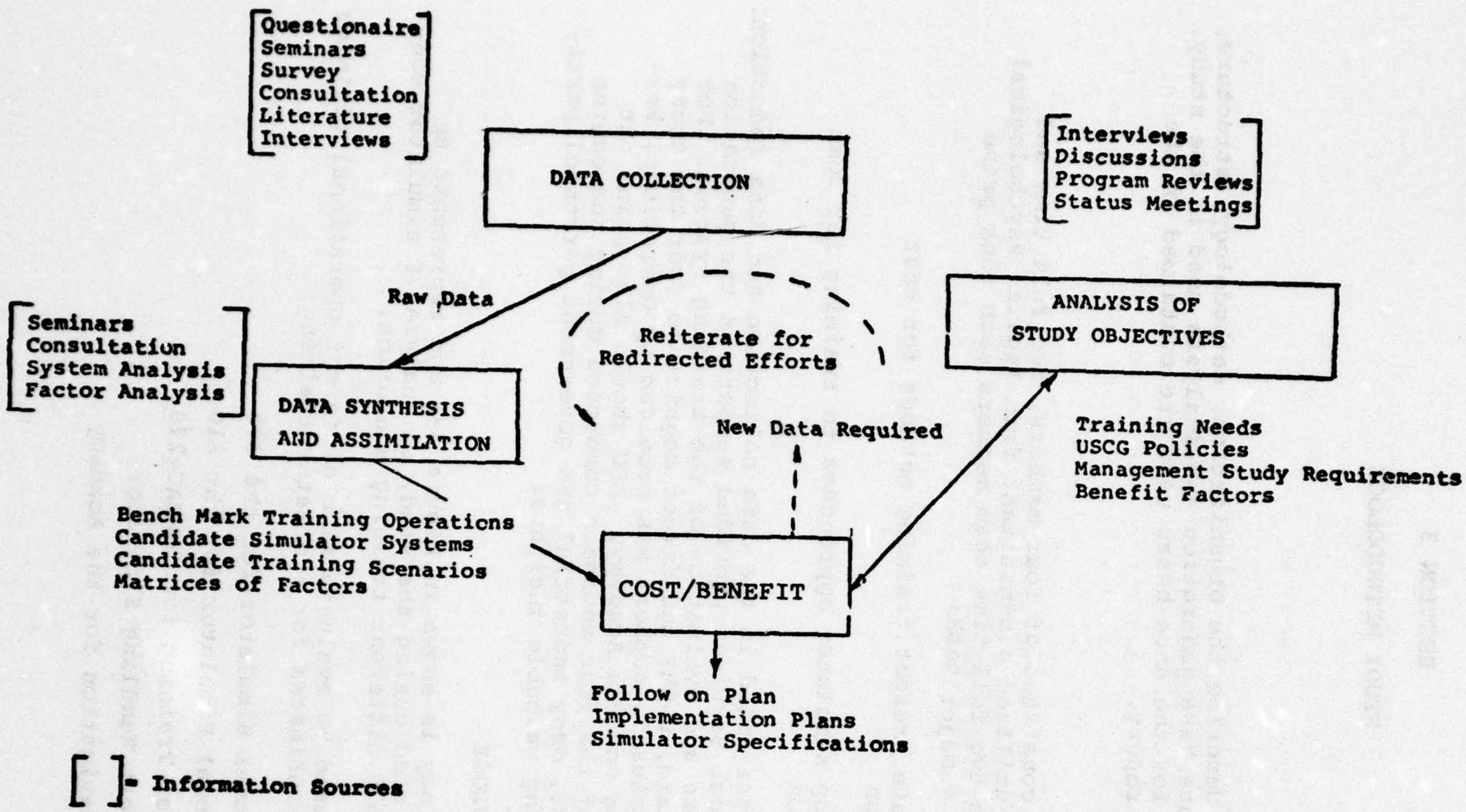

FIGURE 3-1. STUDY METHODOLOGY

In all cases the potential to apply simulators to meet the training needs appears to be cost effective. The bulk of the study effort concentrated on WHEC cutter operational training since its training requirements were most clearly defined and many of the other training areas were a subset of that training system.

3.3 DATA COLLECTION METHODS

There were four primary methods used to acquire the data used in this program: (1) interviews with personnel who possessed, through their experience, in-depth knowledge of the topic under examination, (2) a broad coverage questionnaire which was completed by a large sample of seagoing officers, (3) a series of comprehensive panel discussions involving industry, academic, military and Coast Guard experts in all facets of marine training and particularly in simulation training and (4) study of an extensive library encompassing virtually every significant document on the subject of simulator/device training, its effectiveness and problems. These methods are further detailed in the following paragraphs.

3.3.1 Interviews

Numerous personal contacts were made with individuals cognizant of those aspects of training within the USCG which were of significance to the present study and, in addition, with individuals, groups, industries and institutions known to possess expertise in simulation techniques-based instruction. For the most part these were structured interviews wherein sets of prerequisite questions were compiled prior to the interview. This was done to assure complete coverage and response to the required subject matter. A selected list of the groups/agencies contacted appears in Table 3-1. In most cases, several individuals were contacted at each location.

3.3.2 Questionnaire

A comprehensive questionnaire was developed to provide "An Assessment of Current U. S. Coast Guard Operational Training Methodology." The purpose of the questionnaire was to establish this assessment based upon the actual experience and judgment of the personnel in command positions afloat. Thus, the questionnaire was issued to nearly 400 U. S. Coast Guard officers who were then on, or had recently completed, a PCS tour afloat.

The questionnaire contained over 800 unique data items many of which were structured in a matrix format to facilitate completion. Two hundred thirty-five fully completed questionnaires formed the data base which was loaded into a computer for subsequent analysis. The analysis programs developed were of two basic types. The first, consisting of 30 unique programs, reduced and quantified gross results

TABLE 3-1. AGENCIES/GROUPS CONTACTED

U. S. Coast Guard, Office of Military Readiness

U. S. Coast Guard, Office of Research and Development

U. S. Coast Guard, Reserve Training Division

U. S. Coast Guard, Psychological Research Branch

U. S. Coast Guard, Personnel Training and Education

U. S. Maritime Administration, National Maritime Research Center

Ship Operations Automation Symposium, Washington, D.C.

U. S. Coast Guard, Atlantic Area, Governors Island, New York

U. S. Air Force, Wright-Patterson AFB, Dayton, Ohio

U. S. Coast Guard Electronics Engineering Division

U. S. Coast Guard Liaison Office, CINCLANTFLT, Norfolk, Virginia

Fleet ASW Training Center, Norfolk, Virginia

U. S. C. G. Cutter Vigilant, Naval Amphibious Base, Little Creek, Va.

USN Fleet Training Unit, Naval Amphibious Base, Little Creen, Virginia

USN NTDS Training Unit, Dam Neck Naval Station, Virginia

USCG Reserve Training Center, Boatswains Mates School, Yorktown, Va.

USCG Academy, New London, Connecticut

USCG Cutter Gallatin, Governors Island, New York

Austin Electronics, Advanced Technology Sytems, Roselle, N. J.

USN Surface Warfare Section, Pentagon, Washington, D.C.

AAI Corporation, Baltimore, Maryland

Applied Psychological Services, Wayne. Pennsylvania

NTEC Industry Conference, Orlando, Florida

USCC Reserve Training Center, Yorktown, Virginia

General Electric Corporation, Valley Forge, Pennsylvania

across the broad range of combinations of cutter types, billets and tours. A second group of 18 programs examined and correlated specific responses from specified groups, i.e., WHEC commanding officers on their latest seagoing tour, etc. Together, these 48 analysis variations provide a comprehensive assessment of all elements of operational training and highlight those areas considered deficient and/or in need of review.

A descriptive evaluation of these data supported by tables is provided in Appendix D.

3.3.3 Literature

The study encompassed an extensive literature search which covered industrial, academic and government (NTIS) sources. Much of the key information utilized was derived directly from the U. S. Coast Guard. State-of-the-art simulation technology information was accumulated from producers, users and/or independent evaluators.

Except in a few special cases, these data have been utilized to provide verification of the study direction and interim conclusions and have been translated as final results in themselves. Some of the more pertinent sources, which are directly quoted in this final report, are listed in the Bibliography. This is by no means a complete list of all the documents reviewed as a part of this study.

3.3.4 Panel Discussions

A series of four seminar-meetings were conducted during the course of this study, the topics for which were:

(1) Applicability of Simulators to Marine Training

(2) Effectiveness of Training Using Simulators

(3) Marine Simulator Technology

(4) Future of U. S. Coast Guard Operational Training

Each of the foregoing meetings was attended by selected personnel possessing extensive experience in the particular topics being reviewed. Each of the four meetings was attended by a nucleus of personnel representing U. S. Coast Guard Headquarters--G-OMR, G-PTE, the Academy, Nautical Sciences and Law Department, and the contractor. Agendas, which were similarly structured for each meeting, were designed to assure maximum transfer of pertinent information. At each seminar selected attendees, each expert in his particular field, were asked to develop and present a dissertation in response to a previously established question or topic area. In most cases there were eight such presentations per meeting. By pre-defining and issuing these topical questions to such experts, the relevance, applicability and flow of ideas presented were properly channeled and highly beneficial.

The formal presentations were supported by two separate working group sessions. Here again sets of pre-developed questions were used to assure maximum output for the time allocated, and to maintain control over the direction of the discussions.

3.4 STUDY STRUCTURE

The study was structured to obtain data, form a data base and analyze that data to generate the conclusions. The basic interaction of these tasks is shown in Figure 3-2.

The two major tasks were (1) to define the present training system, (2) to define a simulator training system, and to reduce each to a cost for student hands-on training. These two approaches could then be compared to obtain a guide to the merit of each approach. The simulator approaches, if they appeared promising, could then be further evaluated against the training needs of the Coast Guard as defined by the questionnaire. These could then be further evaluated in a cost/benefit analysis to define the follow-on plan.

The following paragraphs describe this effort which resulted in the definition of a 378 Ship Simulator School to be considered in the cost benefit analysis. The cost benefit analysis had to be considered after the definition of the follow-on plan since the simulator training replaces no operational training completely, but supplements most operational training areas.

3.4.1 Present Training System

The development of the cost for present training methods was accomplished as shown in Figure 3-2. This effort was accomplished by developing the pricing criteria and establishing a cost for student hands-on training per hour of instruction. The details of this effort are covered in Appendix E for each of the present operational training areas.

3.4.1.1 Identify Schools/Training with Operational Content

A review of current operational training (defined as all formalized training conducted while afloat) was performed. It was based on descriptions of such training gathered from published documents and personal interviews. The accuracy of the information presented was constrained by the availability of precise training curriculum data and the level of detailed cost information available. The basic cost data is believed to be the most accurate currently available. This analysis was structured to provide a cost basis upon which to examine operational training alternatives--namely, simulation. It was therefore necessary to define a common basis for this comparison which was determined to be the cost per man hour of 'hands-on' training. This is defined to be only the time during which the student

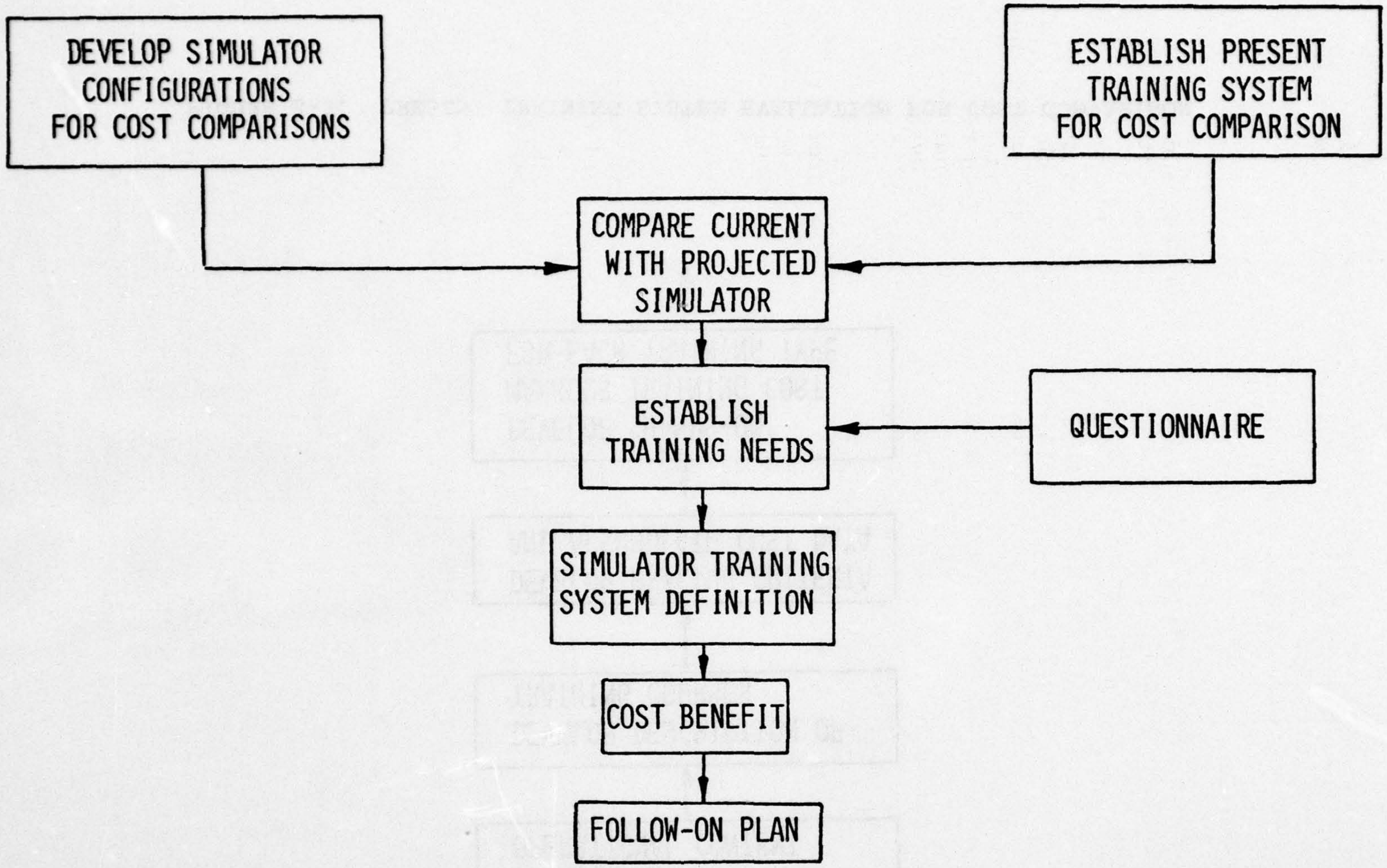

FIGURE 3-2. STUDY STRUCTURE

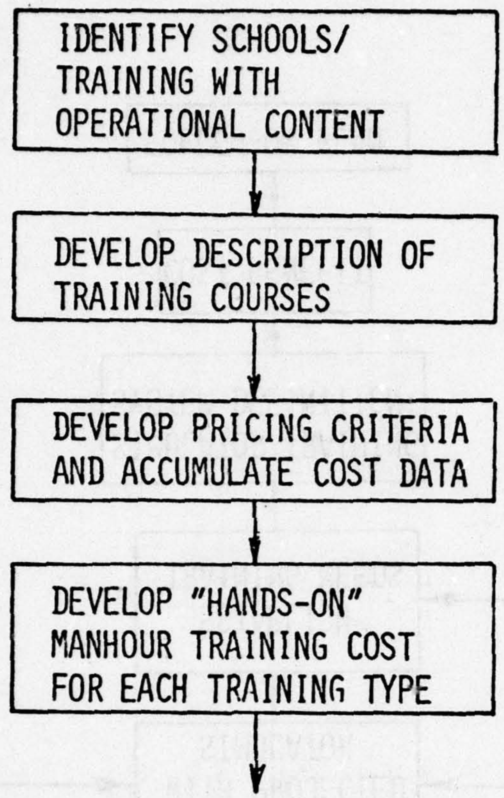

FIGURE 3-3. PRESENT TRAINING SYSTEM EVALUATION FOR COST COMPARISON

is actively involved in the operation, such as while on watch. This is considered a fair basis for comparison since all simulator training would consist of 'hands-on' time.

3.4.1.2 Develop Description of Training Courses

For each training area--Academy, Training Facilities, Reserve Training--a training curriculum was obtained and analyzed to determine its operational training content. In addition, all other operational training approaches were reviewed and correlated with the Training Afloat. These included: Area Training Teams, STD's, MOTU's, Training Availability, REFTRA and ASWEX. The synopsis of this review is contained in Appendix E.

3.4.1.3 Sources of Cost Data

In general, both cost and training curriculum data were secured directly from responsible personnel at each of the representative training facilities surveyed. Other supportive cost data was supplied directly by U. S. Coast Guard Headquarters. In some cases, specific cost elements, necessary for the development of certain parameters unique to the study, were not readily available from existing records. In these cases reasonable estimates were derived from similar applications.

3.4.1.4 Present Training Cost Per "Hands-On" Student/Hour

The training cost analysis was performed for the following operational training facilities:

(a) USCG Academy - Academy Professional and Military Training

(b) LANTAREA Fixed and Mobile Training Facilities - Operational Training

(c) Reserve Training Center, Yorktown, Virginia - Officer Candidate School

(d) Reserve Training Center, Yorktown, Virginia - Small Boat Crew Training

The training cost for four other types of operational training were also established:

REFTRA

Training Availability

Training Afloat

ASW Exercises

These costs were based on the operational cost for the cutter. The summary of this data is shown in Table 3-2. Detail information is contained in Appendix E.

TABLE 3-2. SUMMARY OF PRESENT TRAINING COST

LOCATION / TRAINING TYPE	COST PER STUDENT HANDS-ON HOUR	REMARKS
ACADEMY / T BOATS	$43.33	Depreciated on re-engine cost only - no cost for boat
ACADEMY PAC AREA / SUMMER CRUISE	$54.00	Based on actual for 76
ACADEMY LAN + AREA / SUMMER CRUISE	$52.00	Based on actual for 76
AREA TRAIN-ING TEAM / ATLANTIC MOBILE TEAM	$ 6.76	Based on deployment of 4 Mobility Teams training 140 units/year
AREA TRAIN-I ING TEAM / ATLANTIC LAW ENFORCEMENT	$ 7.92	2 Law Enforcement Teams training 70 units/year
AREA TRAIN-ING TEAM / ATLANTIC SAR	$12.12	1 SAR Team training 35 units/year
AREA TRAIN-ING TEAM / ATLANTIC STD-4	$ 5.09	45 units trained/year. No allowance for equipment depreciation.
AREA TRAIN-ING TEAM / PACIFIC CUTTER TRAINING	$ 9.43	45 units trained/year

TABLE 3-2 (continued)

LOCATION / TRAINING TYPE	COST PER STUDENT HANDS-ON HOUR	REMARKS
AREA TRAINING TEAM / PACIFIC SHORE UNIT	$10.26	35 units trained/year
AREA TRAINING TEAM / PACIFIC STD-5	$ 8.40	35 units trained/year
OCS / SMALL BOAT	$ 9.91	31' PSB
OCC / CUYAHOGA	$28.61	No cost for ship depreciation
OCS / RELIANCE	$41.81	Has ship operation loss and depreciation costs
RESERVE TRAINING / SMALL BOAT	$10.01	Bos'n Mate School 12-week course 31' PSB
REFTRA / WHEC	$24.87	Based on 8 hrs/man/day
TRAINING AVAILABILITY / WHEC	$44.12	Based on 8 hrs/man/day
TRAINING AFLOAT / WHEC	$27.72	Based on 44% of crew in training 1/2 of the time

TABLE 3-2 (continued)

LOCATION / TRAINING TYPE	COST PER STUDENT HANDS-ON HOUR	REMARKS
ASW / ASWEX EXERCISES	$20.50	Expanded crew Turbine operation based on 8 hrs/man/day

3.4.2 Development of Simulator Configurations for Cost Comparison

The development of simulator configurations for cost comparison pursued four steps in sequence with inputs derived from two other sources. The process is shown in Figure 3-4. The details of this are outlined in Appendix C. The following is a brief synopsis of each of the steps.

3.4.2.1 Establish Present Operational Training

The scope of operational training activities was examined from two fundamental viewpoints: (1) the current profile of the various activities providing training to operating units (cutters) and (2) the baseline training requirements for unit readiness evaluation from which all training operations are derived.

This two-step approach was necessary to define the operational exercises which personnel are trained to perform, while identifying the formal courses, and their costs, which are established to provide such training.

As a result, it was established that baseline training requirements would be defined as Refresher Training Exercises, (both Z and J series) prescribed for the 378-foot WHEC. Further, to the extent possible, CG-415 Lesson Plan Outlines which are the same or cover a similar topic, would be associated with specific exercises to indicate the scope of the exercise coverage. In addition, the exercises which encompassed material similar to that provided by Ship Training Detachments (STD's) were also associated with the appropriate Z or J exercise and identified its associated training scenarios in CG-415 and the STD curriculum.

This review of operational training activities and exercises resulted in a compilation of performance criteria which were associated with the Standard Training Requirements ("Z") exercises. That is, all primary operations exercises, from various sources, were integrated to form a single definition of a specific operation. Figure 3-5 depicts this integration process.

Initially, one hundred thirty-six sets of these training/operations packages were developed and correlated with one hundred twenty-three lesson plan outlines. Next, it was necessary to associate the cutter types to which the operations were compatible, the number and type of personnel needed for each exercise and the shipboard equipment required to conduct the operation. As a result, each operations set defined the resources (both equipment and personnel) with the exercise technique required to accomplish the particular training operation. Thus, a definition was established, covering the USCG operational training exercises, that could be directly related to a simulator device or groups of devices. These were next reduced to 185 lesson plans which would be executed in the ship simulator.

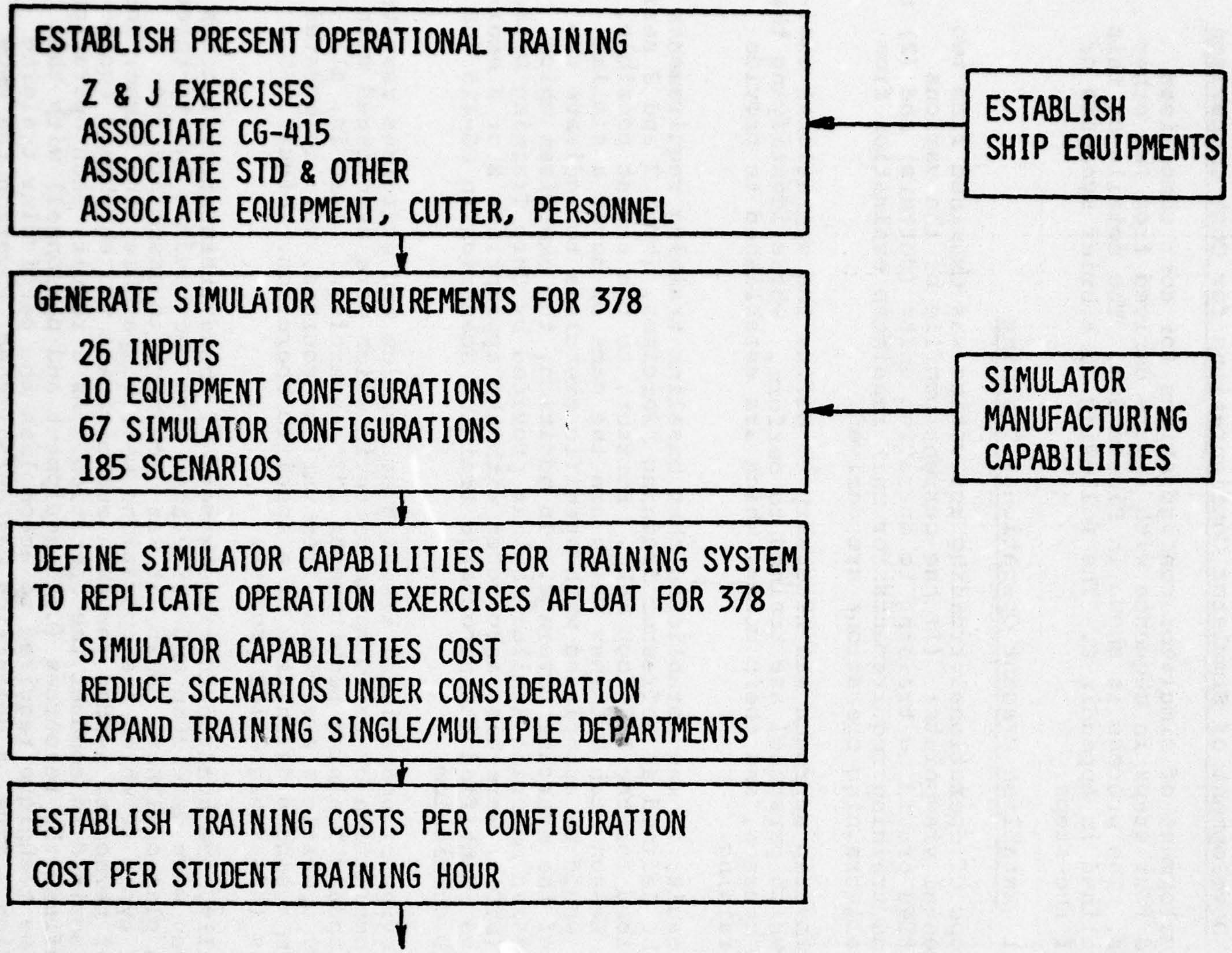

FIGURE 3-4. DEVELOPMENT OF SIMULATOR CONFIGURATION FOR COST COMPARISON

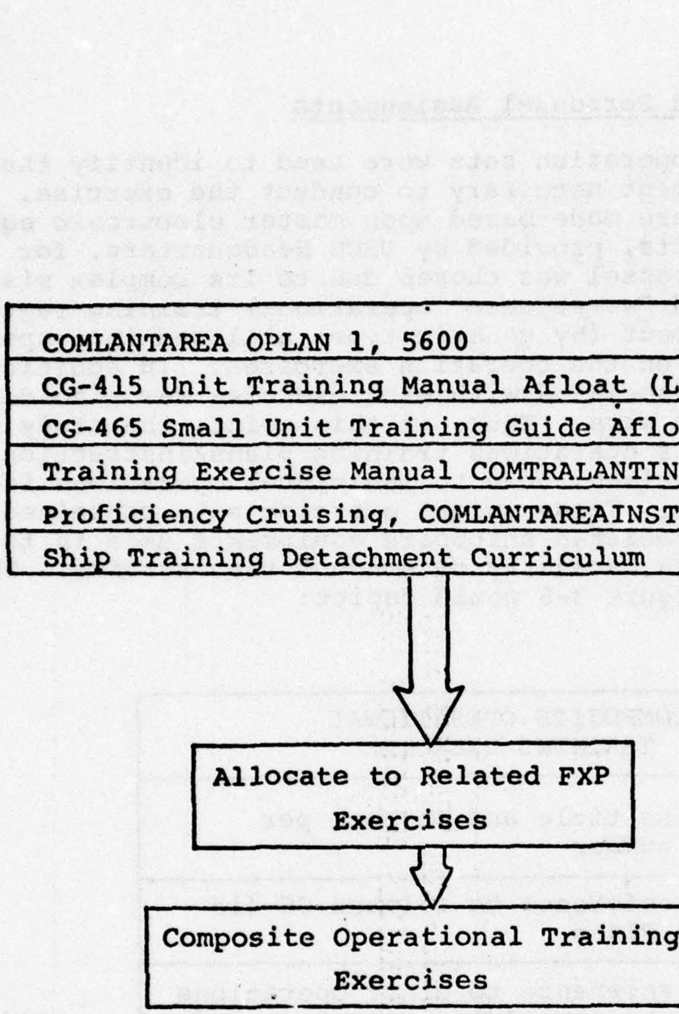

FIGURE 3-5. OPERATIONAL TRAINING ACTIVITIES SOURCE DATA

3.4.2.1.1 Equipment and Personnel Assignments

The composite training operation sets were used to identify the key personnel and equipment necessary to conduct the exercise. The equipment assignments were made based upon master electronic equipment list computer runoffs, provided by USCG Headquarters, for all 378-foot WHEC's. This vessel was chosen due to its complex mission demand which established "worst case" operational training requirements. Thus, all equipment (by generic type) utilized in a specific exercise was documented on the operation exercises. In addition, the key manning by billet associated with each exercise was also documented on the operations sets. Thus, at this point, the study effort had condensed the various operations training plans/instructions, specifying numerous exercises, down to individual operations identified to a unique FXP Z number. These unique exercise sets contained cutter class applicability, associated shipboard equipments used in the exercise, and the manning necessary to conduct the exercise. Therefore, an extension of Figure 3-5 would depict:

COMPOSITE OPERATIONAL TRAINING EXERCISE
Exercise title and purpose per FXP Z number
Cross reference to related CG-415 Lesson Plans
Cross reference to other Operations documents specifying same Z number
List of cutter classes to which exercise applies
On-board equipment functionally associated with exercise
Manning assignments, by billet, required to conduct exercise
Evaluation criteria of performance

3.4.2.1.2 Ship Equipment

With the definition of training exercises for the 378 correlated with equipment and manning, the ship simulator definition was formulated. This resulted in the definition of ten ship departments. The exercises were organized into groups for these ten ship departments, and combinations of departments, with their associated equipments and personnel.

The ship equipment for the ten training departments was selected following an analysis of the equipment lists for both the 378 and the 210. The detail of this analysis is included in Appendix C. The final selection of the equipment configurations for the ship simulator used the equipment which was most typical for the 378 cutter to be analyzed.

3.4.2.2 Generate Simulator Requirements for the 378

With the ship equipments defined for the 378 and with the ship divided into ten departments and each department representing a potential simulator, the simulator configurations had to be defined. These ship department equipments required simulated inputs to duplicate the signals required on the ship for the associated lesson plans. This resulted in the definition of 26 simulator inputs to be generated to drive the ship equipments. With the definition of lesson plans, equipment configuration, personnel and input signals, the next step was to build up the basic simulator configurations, a total of 49. There were a number of permutations of these simulator configurations required to provide the necessary fidelity or coordination of departments to perform the scenarios which brought the list to 78. Each of these configurations could perform some set of the lesson plans. The total of all the simulators could perform all of the 185 lesson plans. The application of the lesson plans to multiple ship departments resulted in 505 scenarios since some lesson plans were run several times (single department, multiple departments and total ship). This was the beginning of the course outline for the ship simulator school.

3.4.2.2.1 Simulator Manufacturing Capabilities

ADC, as a part of this study, surveyed over 80 manufacturers of simulators. These manufacturers provided us with catalogs and data sheets on the kinds of simulators they manufactured which we evaluated for applicability. The results of this analysis are contained in Appendix B.

There were no devices "off the shelf" to match the requirements for the USCG needs; however, there is substantial capability to provide

the necessary devices. ADC used this data base, coupled with advice obtained through the seminars, direct contact with the manufacturers, and, when necessary, our own experience to synthesize costs for each simulator.

3.4.2.3 Define Simulator Capabilities/Cost

The next step in the development of simulator training cost was the development of the simulator procurement costs. This was done for each configuration and included not only the development for the inputs but provided the necessary ship equipment station, the instructor consoles, and the integration of simulator subsystems when required for multiple department operation.

Seventy-eight simulator configurations were analyzed in detail and are included in Appendix C, Paragraph C3.1.1.3. The various simulator configurations each perform some of the lesson plans for the present operational training exercises. When the cost for these were compared to the cost for the present operational training the 21 configurations which performed all the exercises were selected to become the subsystems to make up the 378 ship simulator.

3.4.2.4 Cost Per Hands-On Student Training Hour

The final step was to reduce costs for the desired configurations into cost per student hands-on training hour. The amortization of the acquisition cost was spread evenly over ten years and based on 4160 useful hours per year of operation. The maintenance cost was spread the same way. The cost for instructors to operate the simulator was established and represented the operation cost. The sum of these three costs represents the hourly cost to operate and by dividing the average number of students being trained for each configuration, a cost for hands-on student training per hour is obtained. The results of this are shown in Table 3-3.

The generation of each simulator configuration is based on the use of the previous configuration. Thus, the table for acquisition cost is generated as follows. The first configuration (#5 for the CIC Surface) is a stand-alone procured for $737K. This is divided by 4160 hours per year and 10 years to come up with the hourly cost to acquire. The same value is used for the hourly cost to maintain. The unit is operated by a single instructor which represents the hourly cost for that effort. The average number of students trained for the 26 scenarios is 9 which is divided into the sum of the hourly cost to acquire, maintain and operate to yield the cost for hands-on student training hour of $5.66.

Configuration 6, the CIC - Air is also a stand-alone configuration so that the cost per student hands-on training hour is derived in the same manner.

TABLE 3-3. COST SUMMARY OF SIMULATOR TRAINING

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
CIC Surface Simulator Configuration 5	737.0	17.71	15.57	17.71	26	9	5.66
CIC Air Simulator Configuration 6	247.3	5.94	15.57	5.94	6	3	9.15
CIC Surface/Air Simulator Configuration 7 (5 & 6)	45.0	24.74	15.57	24.74	39	12	5.42
Bridge Simulator Configuration 18A	1,570.0	37.74	15.57	37.74	52	4	22.76
Bridge/CIC Simulator Configuration 23D (7 & 18A)	60.0	63.92	31.14	63.92	76	16	9.93
Communications Simulator Configuration 31A	234.5	5.63	15.57	5.63	44	5	5.36

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.

**Instructor Cost = Officer at $27K + 20% = $32K ÷ 2080 hrs/yr = $15.57/hr.

TABLE 3-3. (continued)

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
Bridge/Comm Simulator Configuration 32B (18A & 31A)	25.0	43.97	15.47	43.97	12	9	11.50
CIC/Comm Simmulator Configuration 33A (7 & 31A)	25.0	30.98	31.14	30.98	15	17	5.47
Bridge/Comm/CIC Simulator Configuration 34A (23C & 32B)	25.0	68.72	31.14	68.72	29	21	8.02
Engineering Simulator Configuration 37A	1,206.9	29.01	15.57	29.01	37	8	9.19
Bridge/Engineering Simulator Configuration 38C (37A & 18A)	35.0	67.59	31.14	67.59	14	12	13.86
Navigation Simulator Configuration 47	92.3	2.21	15.57	2.21	20	2	10.00

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.
**Instructor Cost = Officer at \$27K + 20% = \$32K ÷ 2080 hrs/yr = \$15.57/hr.

TABLE 3-3 (continued)

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
CIC/Bridge/Nav Simulator Configuration 48D (7 + 18A + 47)	80.0	66.62	31.14	66.62	20	18	9.13
ASW Simulator Configuration 41B	1,077.3	25.89	15.57	25.89	4	4	16.84
CIC-ASW Simulator Configuration 42 (41B + 7)	70.0	52.32	31.14	52.32	18	16	8.48
CIC/ASW/Bridge Simulator Configuration 43A (42, 18A)	80.0	91.98	31.14	91.98	29	20	10.75
CIC-ASW-Bridge-Comm Simulator Configuration 44A (43A + 31A)	50.0	98.82	31.14	98.82	18	20	11.43
EW Simulator Configuration 45	384.3	9.23	15.57	9.23	4	2	17.02

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.

**Instructor Cost = Officer at $27K + 20% = $32K ÷ 2080 hrs/yr = $15.57/hr.

TABLE 3-3. (continued)

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
CIC-EW-Bridge Simulator Configuration 46B (7, 18A, 45)	60.0	73.16	31.14	73.16	4	19	9.34
CIC-EW-ASW-Bridge-Comm Simulator Configuration 46C (7, 45, 18A, 31A 41B)	60.0	104.69	31.14	104.69	4	21	11.45
All Departments Simulator Configuration 49A	215.0	153.35	77.85	153.35	47	41	9.37
Total Cost	6,379.6						

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.

**Instructor Cost = Officer at \$27K + 20% = \$32K ÷ 2080 hrs/yr = \$15.57/hr.

The third configuration, #7 (a combination of Air and Surface CIC), assumes that Configurations 5 and 6 are procured and adds the $45,000 to integrate these two configurations. The cost to acquire for that is $1,029.3K (737 + 247.3 + 45) which when divided by (4,160 x 10) is $24.74 for the hourly cost to acquire. The student cost per hands-on training hour is then obtained by adding 24.74 + 15.57 + 24.74 divided by 12 (the number of students) to get the cost of $5.42.

The table contains 10 stand-alone configurations and 11 combined configurations with each cost derived in a similar manner. The final configuration, 49A, represents the total ship simulator and the total cost is represented there.

3.4.3 Establish Training Needs for the 378

With the comparison of simulator training cost in Table 3-3 (representing $5.36 per hour to $22.76 per hour) to the cost of operational training, it could replace (REFTRA at $24.87, Training Availability at $44.12, Training Afloat at $27.72, ASW at $20.50, and $54.00 for cadet summer cruises) the potential cost benefits in procuring the ship simulator are seen to be highly positive. Following is a review of the definition of the ship simulator.

ADC had defined operational training requirements for the 378 by reviewing the exercises used in REFTRA (17) and the lesson plans afloat (18) to create the necessary training scenarios. This was done for all large cutter types and later reduced to those applicable to the WHEC cutter for the analysis. This effort is described in detail in Appendix C.

The training exercises used in REFTRA had been reviewed to determine their purpose, the method of evaluation and the personnel and equipment involved to establish their applicability to training in a simulator. The result of this first effort was the establishment of a number of exercises which might be amenable to simulator training to achieve the same or greater levels of proficiency.

The lesson plans from U. S. Coast Guard operational training were correlated against the exercises used in REFTRA to provide a matrix of applicable lesson plans for each REFTRA exercise. There are 185 lesson plans which were correlatable to the 136 REFTRA exercises. The necessary simulator approaches to create similar conditions for training were established. The simulators requiring 26 input stimuli to meet the training requirements had been defined. The training lesson plans which could be practically and economically simulated were established at 505 which represented multiple scenarios of the 185 basic lesson plans and the capabilities of the simulators were defined for all.

The crew that would be trained in each lesson plan and the equipment that they would use which had to be stimulated or simulated was established. The ten equipment configurations to create similar ship department environments providing training test areas for the exercises were established. These equipment configurations were:

(1) CIC Surface Search

(2) CIC Air Search

(3) Bridge

(4) Communications

(5) Engineering Power

(6) Engineering Diesel

(7) Engineering Turbine

(8) CIC - ASW

(9) CIC - EW

(10) Navigation

The material to support this sequence is contained in Appendix C.

3.4.3.1 <u>Questionnaire Definition of Needs</u>

The questionnaire outlined in Appendix D provided a substantial amount of information offering guidance to this whole study in several areas. Several key questions were asked to provide guidance in the development of a training program using simulators.

One of the first things to establish was whether present training methods meet the training needs for present missions. Table 3-4 shows the output of this question. For his mission the respondant was asked to rate his actual readiness to perform his mission.

As can be seen, the results indicate that present training methods are not fulfilling the needs of the operational groups. The analysis of present training methods could not find complete correlation of training against mission requirements or ship types and we can assume there are shortcomings in present training.

Table 3-5 indicates another area of concern. Present training places the burden of operational training on OJT. Unfortunately, personnel rotation policies reduce the ability to provide adequate OJT on the vessel. Over ninety percent of those surveyed consider that rotation policies 'much' or 'very much' affect the performance and skill development of the crew.

TABLE 3-4. LESS THAN MINIMAL READINESS TO PERFORM MISSION

Mission	% Responding Minimal Readiness or Less
Marine Environmental Protection	77.26
Military Preparedness	55.91
Military Operations	54.05
Enforcement of Laws & Treaties	52.21
Marine Science	40.36
Domestic Icebreaking	35.54
Polar Operations	34.66
Search and Rescue	29.71
Aids to Navigation	23.67

TABLE 3-5. PERCENT OF RESPONDANTS WHO FEEL THAT SKILL DEVELOPMENT IS "MUCH" OR "VERY MUCH" AFFECTED BY TRANSFER AND ASSIGNMENT POLICIES

% of Respondants	Survey Group	No. of Replies
90.6	All	235
95.23	Captains	42
88.0	Commanders	84
94.8	Lt. Commanders	97
75.0	CWO's	12

This 90 percent was made up of 57 percent who stated 'very much' and 33 percent who stated 'much.' With 90.6 percent believing that there was much or very much adverse effect in the training, we reviewed the data to see if there was a difference in the opinion by rank. Table 3-5 shows the output of this data reduction. The difference by rank does not show significant variation.

The next step in the analysis was to review this training evaluation by departments. The questionnaire required an estimate of the percent of the department still in the learning cycle (i.e., could not be expected to reliably complete all functions within the duty assignment). Table 3-6 shows the results of this question by department. The results are not encouraging for the performance of the present training system. The average is poor with between 1/3 and 1/2 of the crew in training. The spread of the answers tells an even worse story.

The spread of the answers says that there are some well-trained crews and some crews in training, If we look at Communications, the best on the average, Table 3-7 shows the complete frequency distribution. We can see that 28% of the officers polled consider one-half or more of the Communications department crew members are in the learning cycle.

TABLE 3-6. PERCENT OF DEPARTMENT WHICH COULD NOT RELIABLY BE EXPECTED TO COMPLETE ALL FUNCTIONS WITHIN THE DUTY ASSIGNMENT

DEPARTMENT	AVERAGE	SPREAD
CIC/ASW (Officers)	54.75%	5% to 99%
Communications (Officer)	54.11%	3% to 99%
Navigation (Officers)	49.24%	1% to 99%
Deck/Weapons	48.69%	2% to 99%
CIC/ASW Crew	42.81%	2% to 99%
Navigation (Crewmen)	38.0%	1% to 99%
Engineering	37.7%	5% to 99%
Operations	37.57%	1% to 99%
Communications (Crew)	33.88%	2% to 99%
Total Average Percent	44.08%	

TABLE 3-7. REDUCED DATA FOR QUESTION 15, SECTION II

NUMBER OF OFFICERS SURVEYED= 235

CREWMEN IN COMMUNICATIONS LEARNING CYCLE (IN PERCENT).

NUMBER OF OFFICERS NOT ANSWERING QUESTION=032

PERCENT	QUANTITY	COL.1 X COL.2
02	001	0002
05	006	0030
10	024	0240
15	003	0045
20	030	0600
24	001	0024
25	028	0700
30	025	0750
33	008	0264
35	004	0140
40	015	0600
45	001	0045
50	029	1450
60	008	0480
65	002	0130
66	001	0066
67	002	0134
70	004	0280
75	004	0300
80	004	0320
90	002	0180
99	001	0099
	---	----
	203	06879

THE AVERAGE PERCENTAGE = 33.88%

This type of spread definitely indicates that training within the USCG is not consistent. The basic effort in a training system is to bring all the people to an acceptable level and allow the more capable ones to excel. This goal is not being met by the present training approach.

The data spread indicates that there are some fundamental flaws in the present training system. The present study contract did not require a detailed analysis of present training system effectiveness; however, this type of response shows the need for such analysis.

Question 18 of Section II in the questionnaire was used to provide some insight into the preferred training approach. The results are shown in Table 3-8. The intent of this question was to point the way to those tasks for which training might best be provided with simulators. For most operational tasks it was definitely indicated that the simulator approach to training is expected to be effective. The acceptance of simulator training is high, as is On-the-Job Training and REFTRA.

Not surprisingly, the preference for OJT (On the Job Training) as the most effective training approach was high in all training tasks. We used this as an indication of the potential for training with simulators when a high degree of realism could be created. Both this question and the correlating questions indicated that a high degree of acceptance would occur for a simulator that replicated the fidelity necessary to provide the team training achieved in OJT.

As we look at the data from this question we can see that it could be used to aid in the planning for a total USCG training program. We can see that certain tasks are being taught using methods which the operating Coast Guard does not believe to be optimum.

The questionnaire also demonstrates the need for the USCG to provide a tighter feedback system to monitor their total training program. The questionnaire indicates a trend toward increasing the use of present training methods while achieving a lower training return for that expenditure. The reasons for this trend should be evaluated in greater detail, again regardless of the use of simulators in the future training system.

3.4.4 Simulator Training System Definition

ADC, in order to gather in-depth and significant data to support this study, ran four one-day seminars. These seminars were attended by 100 people and, as well as providing 25 papers of significance, were organized into working groups of six to eight people each addressing sixteen different questions of significance to the study.

TABLE 3-8. TRAINING METHODOLOGY VERSUS TASKS

18. This is a multiple element question which associates, in an ordered way, specific training methodologies with operational tasks within major categories. Please use the rating scale to associate the significance of the indicated training methods with the operational tasks listed for each category.

Rating Scale:
0 - Not Significant
1 - Low Significance
2 - Below Normal Significance
3 - Normal Significance
4 - Above Normal Significance
5 - High Significance
9 - Not Relevant

OPERATIONAL CATEGORY/ TASKS	TRAINING METHODS							
	Classroom (Formal, Individual)	On-The-Job Training	Simulators	Texts/Manuals/ Audio-Visual	Training Teams/ STD's	Training Availability	Refresher Training	Fleet Exercises
NAVIGATION								
Celestial	4.3	4.6	2.5	3.3	2.2	2.2	1.8	1.9
Piloting	3.8	4.7	3.5	2.2	3.4	2.9	3.9	2.7
Electronic	3.7	4.5	3.7	3.2	3.1	2.6	3.2	2.8
Fog	2.9	4.6	4.1	2.8	3.8	3.0	4.1	2.8
DECK								
Anchoring	2.4	4.7	2.6	2.7	2.6	2.6	3.9	2.2
Docking	2.5	4.9	3.1	2.6	2.3	2.6	3.4	2.2
Boat Lowering	2.4	4.9	2.6	2.5	2.6	2.7	2.9	2.2
Boat Handling	2.5	4.9	2.6	2.6	2.5	2.7	2.7	2.3
Towing	2.7	4.7	2.2	2.8	2.8	2.7	3.9	3.0
Helo Deck Ops	2.8	4.7	2.6	2.9	3.1	3.0	3.3	3.0
GUNNERY								
Spotting	3.0	4.3	3.4	2.9	2.9	3.0	4.4	3.5
Gun Mount Procedures	3.2	4.5	3.8	2.9	3.2	3.4	4.4	3.4
Fire Control	3.3	4.5	4.0	3.0	3.2	3.2	4.4	3.5
Liaison	3.0	4.1	3.4	2.7	3.0	3.0	4.3	3.5

TABLE 3-8 (continued)

Rating Scale:
- 0 - Not Significant
- 1 - Low Significance
- 2 - Below Normal Significance
- 3 - Normal Significance
- 4 - Above Normal Significance
- 5 - High Significance
- 9 - Not Relevant

OPERATIONAL CATEGORY/ TASKS	TRAINING METHODS							
	Classroom (Formal, Individual)	On-The-Job Training	Simulators	Texts/Manuals/ Audio-Visual	Training Teams/ STD's	Training Availability	Refresher Training	Fleet Exercises
SHIP HANDLING								
Anchoring	2.7	4.7	2.8	2.8	2.9	2.9	3.9	2.7
Docking	2.6	4.9	3.3	2.7	2.6	2.9	3.7	2.6
Collision Avoidance	2.6	4.7	2.2	2.8	2.8	2.7	3.9	3.0
Rules of the Road	2.8	4.7	2.6	2.9	3.2	3.1	3.3	3.0
Ice Breaking	3.0	4.3	3.4	2.9	2.9	3.1	4.4	3.5
Heavy Weather	3.2	4.5	3.8	2.9	3.2	3.4	4.4	3.5
CIC								
Anti-Air (AAW)	3.3	4.3	3.9	3.0	3.2	3.2	4.4	3.5
Anti-Surface	3.0	4.1	3.4	2.7	3.0	3.0	4.3	3.5
Anti-Submarine (ASW)	2.7	4.7	2.8	2.8	2.9	2.9	3.9	2.7
Fog Navigation	2.6	4.9	3.3	2.7	2.6	2.9	3.7	2.6
Collision Avoidance	3.5	4.0	4.3	3.2	3.2	3.1	3.2	3.5
Stationing	4.4	3.9	3.9	3.9	3.4	3.3	3.0	3.1
SAR Air Control	2.7	4.8	2.7	3.0	3.1	2.2	1.9	1.9
COMMUNICATIONS								
Visual	2.9	4.4	2.6	3.2	2.3	2.4	2.2	2.4
Voice	3.2	3.7	4.2	3.0	3.2	3.1	4.3	3.9
On-Line Crypto	3.2	3.8	4.2	3.0	3.2	3.1	4.4	4.0
Off-Line Crypto	3.4	3.8	4.5	3.0	3.3	3.2	4.5	4.2
DAMAGE CONTROL	2.9	4.4	4.2	2.8	3.8	3.2	4.2	3.1
Avg. of All	2.9	4.3	3.3	2.9	3.0	2.9	3.7	3.0

The results of these seminars were multi-faceted; however, only those which impacted the development of a simulator approach to training will be discussed here.

One key area highlighted by the seminars was the need for the establishment of a training system approach to be used in the development of a new training program utilizing simulators.

This training system approach is being used extensively today. It recognizes that "people do training, not devices." It takes into consideration that people usually learn best in what is popularly called "self-paced learning" -- basically, let the student learn at his rate, not at the rate of the class or group.

The training system which we selected to model for the 378-foot cutter is shown in Figure 3-6. This would be the basic model for the ship simulator school. This school used for the cost benefit analysis would represent not just a simulator, but a total training system.

This is a training system modeled after the work done by the American Airlines School in Dallas. The effectiveness of that training system has been demonstrated by a greatly improved safety record and lower training costs. The system has demonstrated an enviable record of cost effectiveness. The training system set up by American Airlines has evolved with careful planning over a ten-year period to the point where all training will soon be done in the simulator. Substantial benefits from the reduced use of operational equipment for training has resulted.

The type of training system which was used in the analysis of USCG operational training has several key differences from the American Airlines system. First, the obvious -- it is for ship operations, not aircraft. Second, there is a multi-mission training situation. Third, there is a substantial crew with large teams performing coordinated tasks.

The simulator training envisioned would hope to have key similarities. First, it should have sufficient fidelity to achieve high training transfer; second, the system should use a multi-phased, self-paced, pipeline training approach; third, the system should maximize the training for emergency procedures which cannot effectively be taught in actual operations.

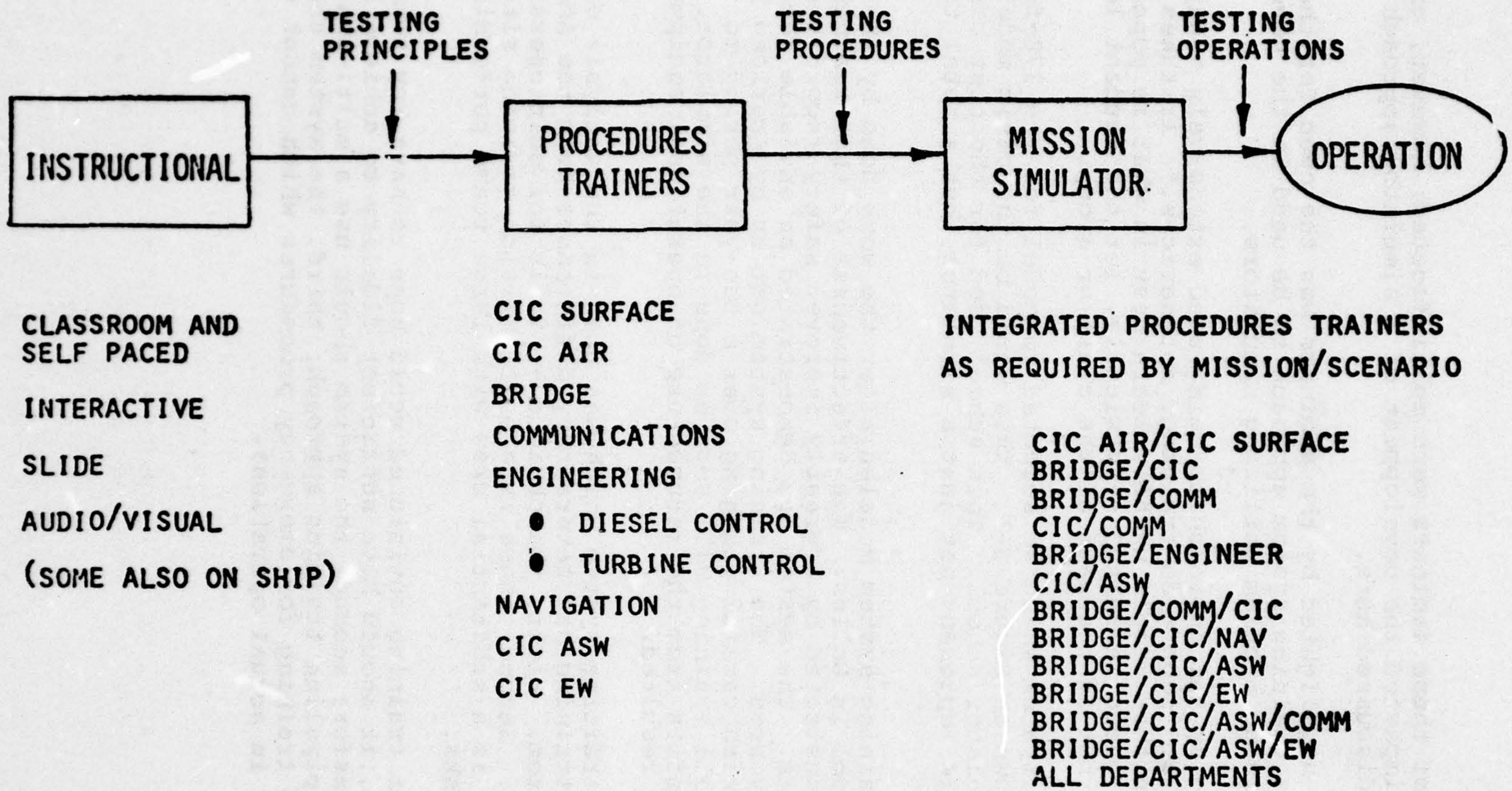

FIGURE 3-6. TRAINING SYSTEM UNDER CONSIDERATION

SECTION 4

SIMULATORS IN THE OPERATIONAL TRAINING SYSTEM

4.0 RECOMMENDED SIMULATORS

The major task of this study was to establish the value to the U.S.C.G. of using simulators in the operational training system. This section describes how the recommendations were arrived at, why they are beneficial, and the how and why they should be implemented. There are many recommendations for future study prior to the implementation to finalize the details of the material needed for that new training system.

4.1 STUDY OBJECTIVES

The study effort covered the entire operational training effort within the U. S. Coast Guard. The study effort was also guided by the U.S.C.G.'s interest in making decisions relative to the acquisition of a Radar/Navigation simulator for the Academy, a small boat simulator for unit training as well as simulators to support the operational training for the U.S.C.G. WHEC's and WMEC's, including the training for the new 270 foot cutter.

The study began with two broad objectives:

- Define present Coast Guard operational training and reduce that to cost for "Hands-on Student Training per Hour."
- Synthesize simulators to provide that operational training and reduce the cost to "Hands-On Student Training per Hour."

Section 3 covers the definition of the present Coast Guard Operational Training reducing that training effort into several categories and establishing a cost per hands-on student hour of training for each category. Each of the simulators under consideration was defined in the same terms and a cost per hands-on student hour of training was established for those as well.

The results of that effort clearly demonstrated that simulator training costs less per student hands-on hour of training than does present conventional operational training.

Of the various simulators of interest for operational training, only one provided a potential for cost comparison. The present 378'

WHEC cutter had a defined training system whose cost and training effectiveness could be established. This is the area where cost benefit analyses could be applied by synthesizing a "new" training system for comparison.

4.2 DEFINITION OF SIMULATORS

Our study effort for the definition of simulators was supported by several efforts, as follows:

- A survey letter was sent to 80 manufacturers and for the 61 who replied, information concerning their products was reviewed for applicability. (See Appendix B.)
- Contact was established with the users of marine training simulators.
- Specific questions on training were answered by present U.S.C.G. officers through the use of our questionnaire.
- Specifications and costs for simulators were reviewed to establish cost/performance capabilities for various technologicial approaches.
- Seminars were run to provide specific information for 16 key areas of interest in the next decade.
- Literature was reviewed to determine optimum approaches to provide desired results with simulators.

This effort showed that the marine training community had already started to utilize two types of simulators that could be applicable to U.S.C.G. operational training. These are the Bridge Simulator and the Radar/Navigation simulators. There are 11 Bridge Simulators in operation and several hundred Radar/Navigation simulators.

The following paragraphs provide the definitions of the various simulators to the level that was available for the study.

4.2.1 Bridge Simulator

The large scale bridge simulator consisting of a wheelhouse, having a wide angle visual presentation with computer control and an instructor console, represents the most costly and complex simulator for consideration. At this time there are eleven of these

devices in operation providing simulation of operations for Deck Officers.* Not all of these are actually in use for training. In fact, most are involved in research and design activities, but a review of their design, operation and cost has aided in synthesizing the simulators for consideration in this study.

The ship simulator configuration considered in this study contains a Bridge simulator whose definition has been based on the mission, equipment, and operations of the WHEC (378' cutter). The Bridge simulator represents one of the most complex simulators contained in the analysis for this study.

4.2.2 Radar/Navigation Simulator

The radar navigation trainer has been requested by the U.S.C.G. Academy to increase their training capability. Such devices are extensively used in the training of deck officers in maritime schools in the U.S. and around the world.

These devices are used to train radar observers and approved courses for the training schools appear in the Federal Register, Volume 34, No. 188, September 26, 1974.[12] Within the United States there are a half dozen schools providing training in this manner. In addition, there are over one-hundred such devices in use around the world.

The radar navigation trainer is also used for collision avoidance training[13] and is often configured with several rooms, each representing vessels which all sail in the same area. These ships can then run various collision avoidance problems initiated by the instructor and solved by the students with the aid of simulated "Bridge-to-Bridge" communication.

ADC has reviewed the many devices in the field which can meet the training requirements at the Academy. They range in cost from $80K to $2 million. For the entry level student, the lower cost device should provide adequate fidelity to meet the training needs of the cadets.

ADC has reviewed the training program schedule for the Academy. Table 4-1 shows the allocation of training cost to the training that would be done in this simulator based on the present Academy schedule as outlined in Appendix E, Paragraphs E4.0 to E4.9.1.

* References 1 to 11 in the Bibliography

TABLE 4-1. COAST GUARD ACADEMY - NAUTICAL SCIENCE - RADAR NAVIGATION TRAINING COST

ELEMENT	FACTOR	REMARKS
A. Number of Own Ship Radar Rooms	2	+ Instructor with students observing.
B. Hours of Radar Training Per Curriculum	7.7	Based on 32.5 hours Nautical Science IV and 20 hours for Nautical Science II.
C. Average number of students Nautical Science II, IV	440	220 students each class
D. Number of classes to receive training	20	Based on 22 students per lab
E. Total training time per year	2,371.6 hours	B x D x A
F. Simulator purchase	$100K	Based on other maritime school purchases, 10K/year amortization
G. Simulator maintenance/year	$ 10K	Based on 10 year life
H. Simulator cost/training hour	$ 8.43	$\frac{100K/10 + 10K}{2371.6} = \$8.43$
I. Instructor cost per student training hour	$ 7.79	15.58/hour/2
J. Direct cost of hands-on training man hour	$ 16.22	H + I

A simulator procured for $100K would have two student positions and an instructor position. Thus, two students are trained by one instructor. The maintenance and acquisition cost have been spread over a ten year equipment life. The training value to the class is greater than is indicated by the per hour cost of $16.22/hands-on student training hour. The class can always be working the plotting problems using the instructor console, thus evaluating the performance of the students in the own-ship training rooms and acquiring additional training themselves.

The high cost per student training hour could and should be reduced through higher utilization of the device. There would be little difficulty in raising the usage to 4160 hours per year providing 8,320 hours of student training time per year. This would allow each student about 19 hours of hands-on training assuring proper learning and retention. The cost per student training hour with that utilization would be down to $10.83:

$$\frac{\text{\$20K Acquire \& Maintain}}{\text{8320 training hours}} + \text{\$8.43 per hour for instructor}$$

This could be reduced still further if an eight-student problem were run. This increases the simulator cost to $200K with a factor of 8 students and a cost for hands-on training hour of:

$$\frac{\text{\$40K Acquire \& Maintain}}{\text{4160 x 8 training hours}} + \frac{\text{\$15.58}}{\text{8 students/instructor}} = \text{\$3.29}$$

student training hour. In this implementation, the Academy could provide training to enlisted radar operators, OCS, and Reserve Students as well as the cadets to provide the utilization.

There is little doubt in our minds concerning the need for this type of training device or some other improvement in professional training at the Academy. This has certainly been demonstrated by the response to the questionnaires and the preparation demonstrated by Academy graduates to assume deck officer responsibility.[20] However, the cost analysis alone may not justify the procurement of this training device because of the low level of utilization afforded within the present curriculum.

The final recommendation for the inclusion of this type of training device at the Academy rests in the resolution of two questions which cannot be answered by this study.

(1) A clear definition of the level of skill needed by an Academy graduate in the skills taught by the Radar/Nav simulator specifically and in relation to the other skills to be taught in Nautical Science.

(2) The method of expanding the professional training at the Academy to utilize the facility as well as other facilities for training and still provide the present broad professional training.

ADC recommends that this type of device training be considered for the Academy cadets either through modification of the curriculum, expansion of the student hours affording more hours to use the device, other usage of the device beyond student training or operation of the device for training at a location where both cadets and others could be afforded training.

Operational training at the Academy is sorely needed to meet the training requirements for job entry as indicated by the surveys of the cadets and the officers they report to following graduation. The use of simulators to meet those training requirements is cost justifiable based upon proper utilization of the facilities; however, the emphasis on academic training at the Academy makes it impossible for ADC to define the time which can be made available in the curriculum for that utilization.

4.2.3 Small Boat

ADC has addressed the evaluation of a trailerable small boat simulator to provide small boat (41') SAR training. The simulator has been configured to provide a trainer specifically for the SAR problem. The training problem is to navigate to a ship in distress and establish a tow.

The training scenario selected for this problem requires the student to navigate through a channel at night in fog to find and rescue a vessel in distress. Own ship would be the 41 foot U.S.C.G. boat. The vessel would be acted upon by wind and current in various channels similar to those at the trainee's station.

The outlined training would use the radar and local charts for navigation, with the distressed vessel to be detected and tracked on radar. The instructor station would provide the necessary radio contact for the problem as well as monitor the problem to assure that rescue vessel is maintained in the channel.

Table 4-2 shows the cost buildup for the small boat trainer. This table separates the development costs from the recurring costs in order to allow determination of a price for either one, two or three units. This is assumed to be a development effort since no simulator of this type has been identified in the survey of manufacturers.

TABLE 4-2. COST FOR DEVELOPMENT OF SMALL BOAT SIMULATOR
(Based on Company with 100% OH at 10% Profit)

	Development	Recurring Cost
System Design	$ 20,000	$
Trailer & Modifications		50,000
Hardware for Night Scene Visual	110,788	17,539
CPU & Peripheral		21,150
Software for Night Scene Visual	48,680	
Fabrication Labor		17,539
System Test & Integration		35,000
Radar Hardware	16,612	3,924
CPU & Peripherals		18,350
Software for 100 Point Radar Targets	45,452	
System Test & Integration		4,000
Operator Console		8,000
CPU & Peripherals		18,350
Software	58,584	
Fab		9,000
System Test & Integration		18,000
Totals	$ 280,146	$ 220,852
1st unit	$ 500,998	
+ 10% Profit = Acquisition Cost	$ 551,097	
3 units =	$ 942,702	
+ 10% Profit = Acquisition Cost	$1,036,972	

The cost for the development of the simulator shown in Table 4-2 is based on a three-computer configuration, night scene CGI Visual with 100 point light sources, and 100 radar target presentations with data base generation for those gaming areas developed at the instructors' console. The estimated costs are based on purchase from a company with 100% overhead at a 10% profit margin.

The cost for the simulator is then used to support Item E in Tables 4-3, 4-4 and 4-6 to derive a cost-per-student training hour. The basic assumption in the analysis for this cost is that there are two students being trained in the mobile simulator.

Table 4-3 results in a cost-per-student training hour of $33.65; Table 4-4, with the purchase of one additional simulator, represents a cost of $24.80/hour; and Table 4-6 represents a cost of $23.35 as a result of having three simulators in operation.

The present study reviewed in depth the WHEC Operational Training but did not detail the small boat training. There is some definition in the Small Unit Training Guide (Afloat) and we must assume that the training is done by the units. The OJT to match this simulator training could be accomplished through the use of two 41' cutters to practice this rescue/tow problem.

Table 4-5 represents a cost analysis for OJT to perform the same training. The cost is based on using the units' 41 foot cutters and unit personnel and would cost $138.99/hour. Thus, the cost to achieve the same level of hands-on training would be higher.

In order to make this analysis complete, it is necessary to establish the need for this training, evaluate potential alternate methods to obtain the training and investigate the implementation costs more closely. ADC recommends that this analysis be undertaken utilizing the same type of approach for unit training as was used in the analysis of operational training. From the present level of analysis, it appears to be a desirable approach to achieve the required level of training and should be considered further.

Two factors which must be considered are in the utilization of the trailerable simulator and in the number of students trained. The cost-per-student training hour is quite sensitive to the number of students trained (which is analyzed for two at a time) and the number of hours used. The exact utilization will depend on the number of people to be trained at each unit, determining that this will support a two-shift operation. Then these cost analyses are logical.

TABLE 4-3. SMALL BOAT HANDLING SIMULATOR

One Unit East Coast

	ELEMENT	FACTOR	REMARKS
A.	Units trained per year	51	4 days training per unit 1 day travel between units
B.	Number of personnel assigned	3	8 days maintenance
C.	Operator cost per man year	$ 15K	Travel per diem, etc./man
D.	Total operating cost	$ 45K	B x C/year
E.	Simulator/trailer Acquire Cost/Year	$ 55.1K	$551K/10 yr life
F.	Simulator maintenance/ year	$ 55.1K	Labor and material based on acquisition cost/10
G.	Direct salaries/year	$ 64.5K	$32,400 officers 2 x 16,250 enlisted
H.	Total cost/year	$219.7K	D + E + F + G
I.	Training days/unit	4	
J.	Transit time per unit	1	
K.	Training days/year	204	A x I
L.	Cost per training day	$1076	H ÷ K
M.	Training hours/day	32	2 student/16 hour/day
N.	Cost per training hour	$33.65	L ÷ M

TABLE 4-4. SMALL BOAT HANDLING SIMULATOR

2 Units - one East Coast, one West Coast

	ELEMENT	FACTOR	REMARKS
A.	Units trained per	102	
B.	Number of personnel	6	2 officers, 3 enlisted
C.	Operating cost per man year	$ 15K	Travel, per diem, etc./ man year
D.	Total operating cost	$ 75K	B x C
E.	Simulators acquire/yr	$ 72.2	$722K/10 years
F.	Simulators maintenance/yr	$ 72.2K	$722K/10 years
G.	Direct salaries/yr	$104.5	2 x 32,000 + 3 x 16,250 =
H.	Total cost/year	$323.9	D + E + F + G
I.	Training days/unit	4	
J.	Transit time/unit	1	
K.	Training days/year	408	
L.	Cost per training day	$793.87	H ÷ K
M.	Student Training hours/day	32	2 student/16 hours per day
N.	Cost per training hour	$ 24.80	L ÷ M

TABLE 4-5. ALTERNATE SMALL BOAT TRAINING

	ELEMENT	FACTOR	REMARKS
A.	Unit travel per day	1	
B.	Number of personnel	2	1 for each vessel
C.	Operating cost/man yr	0	
D.	Total operating cost	0	
E.	Ship cost per year	$ 38K	$190K/10 yr x 2
F.	Ship maintenance/yr	$ 38K	Same as above
G.	Daily ship cost	$310.20/day	258 days/year 245 usable
H.	Fuel cost hourly	$ 20/hr	40 gal/hr @ 50¢/gal
I.	Fuel cost/training day	$120/day	6 hr sail, 2 ships
J.	Cost of Personnel	$125.77/day	$16,225/258 x 2
K.	Total cost/training day	$555.97	G + I + J
L.	Actual training hours	4 hours	
M.	Cost per hands-on student training hour	$138.99	K ÷ L

TABLE 4-6. SMALL BOAT HANDLING SIMULATOR

2 Units East Coast, one Unit West Coast

	ELEMENT	FACTOR	REMARKS
A.	Units trained per year	153	4 day training per unit 1 day travel between
B.	Number of personnel assigned	7	2 officers - 5 enlisted
C.	Operator cost/man year	$ 15K	Travel per diem/man
D.	Total operating cost	$105K	B x C
E.	Simulator acquisition/ yr.	$103.6K	3 units Acquisition Cost/10
F.	Maintenance/year	$103.6K	
G.	Direct salaries/year	$145.25K	(2 x $32K) + (5 x $16.25K)
H.	Total cost/year	$457.45	D + E + F + G
I.	Training days/unit	4	
J.	Transit time/unit	1	
K.	Training days/year	612	A x I
L.	Cost per training day	$747.46	H ÷ K
M.	Student training hour/day	32	2 students x 16 hours/day
N.	Cost per student training hour	$23.35	L ÷ M

ADC could not define a clear cost benefit situation to finalize on a recommendation and also must recommend that further study be undertaken before inclusion in the training system. The cost analysis does indicate that this approach should be undertaken.

4.2.4 COMDAC (WMEC-270)

The new 270-foot cutter with the COMDAC automated command and control system will require some new approaches to training in the U. S. Coast Guard. The ship, the electronics for the ship, the ship's missions and its crew are still in the planning stages. The concept design is outlined(14) and the preliminary manning is outlined;(15) however, for a detailed analysis of this study there was no training system which could be used for cost comparison.

When the final design of the 270 is established, with the manning identified, the training should be planned for a land-based simulator. The final configuration of that simulator specification, training scenarios and operation can then be completed. We must assume that if a simulator system is cost effective for the 378, then it would be cost effective for the 270, but further study will be required to establish the detailed requirements and quantify the actual costs and benefits.

In determining the recommendations to develop a COMDAC simulator several factors were considered. A comparison to the development of the 378 simulator follows:

- The COMDAC simulator is smaller.
- The simulator development should cost less.
- The benefits should be greater.
- The number of students should be less.
- There would be more non-training usage.

The simulator development costs should be less since it would build on efforts undertaken in the development of the configuration management facility planned as part of the system development engineering effort. This will impact the cost of the simulators' development as well since much of the software should be developed in that effort. The development of the input sensor signals to drive the COMDAC computers (as opposed to sensor displays) presents a simpler development effort for the simulator while using more ship equipments and operating programs.

The benefits for having the simulator should be greater although impossible to quantify at this time. There is no training system to compare it to as there was in the case of the 378. It is difficult to envision a training system for this ship without using simulation due to the high level of ship and sensor automation. The training effort should include scenarios to train the operating crew to assess maintenance problems (failures). They should also be

trained to establish equipment reconfigurations to allow mission completion with degraded operation of the system.

ADC recommends that several steps be undertaken in the development of a simulator for the 270. These are outlined in Appendix A.

4.2.5 378 Simulator

The present 378 cutter with a defined operational training program has been used as the model for the definition of simulators for operational training. The training analysis was done for the 378-foot cutter since the training approach for that vessel is in operation. Both the effectiveness of that training and its cost can be established and compared to the cost and effectiveness for providing that training with simulators.

The definition of the simulator has been established in Section 3, being built up from 10 procurements of simulators for individual ship stations and 11 procurements to allow those ship stations to operate as multiple departments.

4.2.5.1 Projected Systems for the 378

The projected systems using a land-based simulator were configured to replicate the performance achieved in REFTRA and in the Training Afloat. The simulator configurations were planned to achieve the desired fidelity providing all the stimuli needed for the exercise. The complete analysis is contained in Appendix C and is summarized for the configuration selected in Table 3-3 (Section 3.4.2.4).

The results of the comparison of cost for hands-on student training on the simulator versus the present training approaches show that with \$5.36 to \$22.76 per hour in the simulator compared to \$24.87 for REFTRA, \$20.50 for ASW, \$27.72 for Training Afloat, \$54.00 for Cadet Summer Cruises, and \$44.12 for Training Availability, simulator training should be analyzed further.

The analysis of the simulator training system to use is contained in Appendix C and the cost per student hands-on training hour for the final 21 configurations is summarized in Table 3-3 (Section 3.4.2.4)

The training system to use for the 378 ship simulator is outlined in Paragraph 3.4.4.

4.2.5.2 Lease Considerations

The study effort, in addition to reviewing the simulators which could be procured, looked at those simulators which have already been built and are operational. In some cases these units might be rented to run some of the scenarios that are required by the U. S. Coast Guard.

The three U. S. facilities (CAORF at Kings Point, Ship Simulator at MSI, and CARS Radar Trainer at MITAGS) could provide inputs to aid in the development of the U. S. Coast Guard training scenarios and simulator specifications.

These units would all require substantial modification to meet the U. S. Coast Guard requirements and all of them have sufficient present utilization that they could not or would not be usable.

The continued use of Navy training facilities for both classroom or simulator training is an economical approach. There are modifications recommended now, particularly in the use of the ship as a "hotel" for training availability, but the use of these facilities should be continued as long as they remain viable from a training point of view and economical compared to other training approaches.

4.2.5.3 Acquisition

The ship simulator acquisition schedule is outlined in Appendix A. The acquisition of simulator hardware is integrated with the training system development. This process will allow sufficient time for the development and maturation of the training scenarios prior to the start of student training. The acquisition process for the 21 subsystems for the 378 continues well out into the mid-1980's to allow proper evolution of the simulator training systems.

4.2.5.4 Scenario Development

The scenario development occurs in three steps as outlined in the follow-on plan in Appendix A. The first step will be coordinated with the detail definition of the USCG training system utilizing the ship simulator for both the 378-foot cutter and the new 270-foot cutter using the COMDAC system.

The first step will deal with the basic 185 lesson plans considered in this study phase. These scenarios will each have to be evaluated to detail specifications for the 10 ship equipment configurations, the 26 simulator input requirements and the 21 simulator configurations to be developed. This will also potentially expand this lesson plan base to include sufficient scenarios for all the diverse USCG missions.

The second step will be to specifically expand the lesson plans for each of the 21 simulator configurations. This expansion will create similar lesson plan scenarios uniquely keyed to the 21 simulator configurations. This expansion in our present analysis creates 505 scenarios.

The third step in the scenario generation will be achieved by the instructor staff during the validation of each of the simulator configurations prior to beginning training. This final step, carried out with the actual simulator, will finalize each scenario, developing

the training strategy for the instructor, allowing him to build up the necessary check points as each scenario develops. This final step develops a complete syllabus for the ship simulator school.

4.2.5.5 Maintenance

The maintenance costing approach for the cost/benefit analysis has taken a factor for maintenance cost based on the equipment acquisition cost of 10 percent of the acquisition cost per year. This should be a very liberal factor for maintenance, considering that the bulk of the simulator configurations are made up of solid state electronic equipment.

If we take the maintenance cost projected for the full ship simulator in 1985, it represents an annual cost of $637,900. If maintenance is performed by a staff of one officer and ten enlisted men (one for each equipment configuration) we see direct annual salaries for maintenance of $194.5K. This would allow $443.4K for the procurement of replacement material. The simulator configuration has been made up of 17 commercial minicomputers which may be maintained by the computer manufacturer. The average cost of these computers including peripherals is $45K and if we take maintenance from the computer manufacturer at 1 percent of the value per month, this would be another $91.8K for maintenance. This would still leave $351.6K for replacement material, a rather high factor for the material parts.

The maintenance of the simulator is not merely repairing it when something fails, but of keeping it current in performance. Thus, we can assume that another officer and 5 enlisted men would be involved in testing, measurement and modification to keep the simulator current with actual operations. These represent an annual salary of $113,250 with a travel budget of $75,000 to allow the staff to sail with the ships in operation, and the remaining $163,350 would procure the necessary parts and/or software support for this effort.

4.2.5.6 Operation

The operation of the ship simulator facility is made up entirely of officers as instructors in the analysis presented in Section 3.4.2.4. Thus by 1985 we see a two-shift, 20 officer training staff to operate the full-ship simulator.

Under the assumptions on utilization detailed in Paragraph 4.5 we see that this instructor time is adequate. The school operates with a 4:1 student/teacher ratio and the present analysis leaves adequate teacher time for the support efforts required in the school. Student time is utilized 76 percent of the time (based on 8-hour day), and instructor time for simulator operation is 46.3 percent of the time for actual simulator training.

4.2.5.7 Student Training Program

The student training program is based on sending approximately sixty students from each 378 in operation to the ship simulator per year. This will match the rotation rate for the ship crews. The ship simulator will train 120 students per ship and the two-year tour of duty will average out the student load to one-half each year.

Each student would spend one month at the ship simulator school performing the appropriate set of the total 505 scenarios to match his new job requirements. The training process would be mandatory. This should at any time provide each ship with 60 people who have undergone the necessary training for their respective ship's departments within the last year. This should greatly increase the efficiency and effectiveness of the OJT efforts as well as improve the overall ship operations.

The ship will still undergo REFTRA once a year although for a shorter period so the entire crew will receive this type of training, repeating some of the same training scenarios in operation that were experienced in the simulator.

The ship simulator is configured to provide the necessary ASW training exercises which result in the same general approach as for REFTRA. Thus, the ASW exercises can be more readily performed in the underway training provided there and the cost of those exercises could and should also then be reduced.

4.3 COST/BENEFIT ANALYSIS

The cost benefit analysis has been done in two steps to allow the study to work toward a potential follow-on plan. The first step was to compare the cost of the training approaches now in use with the cost of training on simulators. This gives us some feel as to the potential value of each training approach.

This approach was used since there is little hope or desirability for eliminating present training approaches completely to allow an "old way" versus "new way" cost/benefit analysis. The training efforts cannot be made identical to allow this one-for-one replacement. The best way to learn to sail is to sail, since there are so many factors involved in that process. A simulator to achieve proper fidelity for all of the training cues is impossible to specify and is not economical today.

The second step in the analysis was to look at the total cost factors for the planned training system. Here additional cost for the development of the simulator scenarios, a building to house the system, etc., must be considered to see if the necessary assumptions for the first analysis hold up.

4.3.1 Cost Factors

The cost factors for the development of a ship simulator per the follow-on plan outlined in Appendix A are summarized in Table 4-7. Several simplifying assumptions have been used in the generation of these costs. In each case these simplifying assumptions cause the net present worth to be higher than would be expected since the time cost of money or the scheduled buildup of costs have not been taken into account. In most cases 1977 dollars were used.

The acquisition cost of simulators represents the total cost to acquire the 21 subsystems outlined in Section 3.4.2.4. The cost used is as if all subsystems were procured today with 1977 dollars and is higher than would be obtained if the time phased expenditure of funds were taken into account since the money is expended out to 1985.

The cost to generate the specifications for the 21 procurements is assumed to be $50,000 each. (This is the cost that has been used for one man year of effort.) Again, the cost used is as if all money were spent today and is higher than would be obtained if the time-phased expenditure of funds were taken into account.

The basic scenarios to be written for the simulator prior to procurement will provide more detail for the generation of simulator specifications and lesson plans. The cost for this effort is also as if the money were spent today and is higher than if the time-phased expenditure were taken into account. (1977 dollars used)

The procurement or modification of facilities to house the simulator is estimated at $2,500,000 and no net present worth is generated based on the time that money will be spent. (1977 dollars used)

The creation of a new training system including the 378 ship simulator requires several tasks be performed as outlined in Appendix A. The cost used is again as if all the money were spent for this effort today. (1977 dollars used)

The net present worth of the total maintenance program has been assumed to be $637.9K spent annually. This cost is higher than would be obtained if the maintenace department cost is analyzed for the phased buildup since that amount of money is not spent in maintenance until 1985. The capital recovery factor used is 6.145. This capital recovery factor is based on a ten-year life with a 10 percent rate of return for money to come up with the net present worth of $4,108,000.

TABLE 4-7. COST FACTORS FOR DEVELOPMENT OF A SHIP SIMULATOR

ITEMS	COST IN 1,000's	REMARKS
Acquisition of Simulators	6,379.6*	21 Configurations
Specifications	1,050 *	21 at 50K Each
Basic Scenarios	1,850 *	185 at 10K Each
Building	2,500 *	Build or Modify
Create New Training System	1,200 *	Various
Net Present Worth of Maintain - 10 Years at 10% Interest	4,108 **	10 Years at 637.9K per Year
Total	17,087.6	

* Item cost would be reduced if converted to Net Present Worth due to the time phasing of spending.

** Item cost would be reduced if scheduled build up as a function of time were considered.

4.3.2 Benefit Factors

The determination of the potential benefit factors to be achieved in the implementation of the 378 cutter crew training due to the use of simulators requires a brief review of the present operational training schedule. This is shown in Table 4-8 for all cutters.

Simplifying assumptions have been used in the benefit factors in the true cost of the effective benefits. These generally have used 1976 dollars rather than assessing the future cost for these expenditures. In each case, the simplifying factors would cause the net present worth of the benefit to be lower than would be expected if the true time costs of the economic factors were taken into account.

The modifications to the present USCG training system are recommended as follows:

(1) Eliminate using the ship for a hotel for Training Availability since travel and per diem cost are substantially less than the ship's operating cost. The analysis for present training is contained in Appendix E and synopsized in Table 4-9. This will reduce the student load at Navy schools per year from 12,936 man days to 6,468 as a result of the simulator training provided. Referring to Table 4-10 the annualized cost is obtained based on the cost of $19,407 per ship day times the 168 ship days presently used for training availability.

This is converted to the net present worth of $20,032,000 based on the capital recovery factor of 6.145 considering this for ten years at a 10 percent rate of return. The probable benefit of $20,032,000 is reduced by $2,292,000 to $17,740,000. The $2,292,000 is the net present worth of the travel and per diem cost for sending the students to Navy Schools for 6468 man days at $57.69/day (i.e., 6468 x $57.69 = $373,138 which when multiplied by the capital recovery factor of 6.145 equals $2,292,000).

(2) Reduce REFTRA from four weeks to two weeks since the training provided for most of the crew is performed in the simulator. The analysis for REFTRA is contained in Appendix E and synopsized in Table 4-11. The present annual cost for REFTRA is based on the 336 ship days used times the $19,407 cost per day for the ship. The net present worth is obtained by multiplying this annualized cost by the capital recovery factor. The probable benefit is obtained by obtaining the net present worth of the reduced training use of the ship days.

TABLE 4-8. OPERATIONAL TRAINING SCHEDULE FOR CUTTERS

Training Type \ Cutter Type	WHEC 378 ft.	WHEC (Other)	WAGB	WMEC	WLB
Tng. Availability	2 wks/12 mo	1 wk/18 mo	1 wk/18 mo	1 wk/18 mo	1 wk/18 mo
Refresher Tng.	4 wks/12 mo	3 wks/18 mo	3 wks/18-24 mo	2 wks/18 mo	2 wks/18 mo
Shakedown Tng.	5 wks	5 wks	3 wks	3 wks	3 wks
Fleet Exercises	------------------ One per ASW Equipped vessel/year ---				19 days/year
Multi-Unit & Joint Operational Exercises	------- As required by Operational Commander and Unit Commander -------				
GIE Independent Gunnery Exercise	------------------ Per USCG Ordnance Manual (CG-272) and Area & District Instructions ------------------				
Training Teams & STD's	------------ As designated by Area and District Commanders ------------				

REFTRA = 32 billets assigned to various locations.
Liaison = 7 billets assigned to various locations.

TABLE 4-9. TRAINING AVAILABILITY

ELEMENT	COST FACTOR	REMARKS
<u>Present System</u> Cost of Fuel/Ship	1,806	21 hours transit time one way x 2 x 43/hr = fuel
Ship Days	168	14 x 12
Training Availability, Total Ship Fuel Cost	21,672	12 x 1806
Personnel Requirements	25,872 man days	154 Crew x 12 Ship x 14 days
Training Time Man Days, Present Assumption	12,936	77 men per ship x 14 days x 12 ships - since 50% trained each day
Annualized Cost	3,260	$19,407 x 168
<u>Projected System</u> Travel & Per Diem	57.69	MOTU travel based on 15K/year is 15K/260 day/year
Annual Cost to send to school	373 K	6468 x 57.69
Net Present Worth to Provide Travel & Per Diem	2,292 K	373 x 6.145
Number Man Day School	6468 man day school	1/2 of present 12,936
Number of Man Years Required	2487	6468/260 man days/year

TABLE 4-10. POTENTIAL BENEFITS (378 SHIPS)

PRESENT TRAINING	ANNUALIZED COST (MILLIONS)	NET PRESENT WORTH (MILLIONS)	SHIP DAYS PRESENTLY USED	PROBABLE BENEFIT NET PRESENT WORTH* MILLIONS 50%	PROBABLE AVAILABLE SHIP DAYS	REMARKS
Training Availability	3.260	20.032	168	17.740	168	Minus net present worth of travel/per diem of 6,468 MD at 57.69/day = 2,292K
REFTRA	6.520	40.065	336	20.032	168	28 day/year x 12 ships x $19,407/day
ASW	4.424	27.185	228	13.592	114	19 day/year x 12 ships x $19,407/day
Cadet Summer Cruise	4.950	12.044	255	12.044	255	255 cutter days (WHEC) x $19,407/day
TOTALS	19.154	99.326	987	$63.408	705	

Probable ship-year savings 705/180 = 3.91 ships

Potential ship-year savings 987/180 = 5.48 ships

* Net present worth based on Capital Recovery factor of 6.145 for ten years at 10% rate of return.

TABLE 4-11. REFTRA

ELEMENT	COST FACTOR	REMARKS
Present Cost of Fuel/Ship	6,880	Assume 20 days at 8 hr./day x 43/hour
Ship Days	336	28 days x 12 ships
REFTRA Total Fuel Cost	82,560	6880 fuel/ship x 12 ships
Personnel Requirements--Present	51,744	154 man crew x 28 days x 12 ships
Reduce to Two Weeks/Year for Proposed	25,872	154 man crew x 14 days x 12 ships
Personnel Requirements Proposed	25,872	154 man crew x 14 days x 12 ships

(3) Reduce the ASW training from 19 days to 9.5 days since the training provided for most of the crew is performed in the simulator. The analysis for ASW is contained in Appendix E and synopsized in Table 4-12. The present annual cost for ASW Exercises is based on the 228 ship days used times the $19,407 cost per day for the ship. The net present worth is obtained by multiplying this annualized cost by the capital recovery factor. The probable benefit is obtained by obtaining the net present worth of the reduced training use of the ships.

(4) The cadet summer cruise using dedicated cutters should be eliminated. The cadets should be trained in the ship simulator and receive at-sea training on operating cutters to provide the necessary at-sea time. The annualized cost for the cadet summer cruise is based on the cost for 1976. This cost is assumed to then be constant for the next ten years. The net present worth is established using the capital recovery factor.

(5) Reassign the personnel assigned to the Navy as the simulator provides the necessary training and support which will reduce the student load in Navy schools.

(6) Potentially reduce the crew on the 378 as the training system with simulators reduces the training required in OJT.

Table 4-10 lists the potential benefits to be obtained by these reductions in the present operational training system using the WHEC 378 cutter. These are the potential benefits to accrue as a result of the reduction of these training efforts afforded by the utilization of the ship simulator to meet the training needs. Some of these benefits can be attributed to the implementation of more cost-effective training approaches as well as a result of using simulators for training.

In order for the benefits to be realized, the available cutter days as a result of the altered training program must be put to operational use. Within the present forecasts as we know them, these cutter days are presently needed to fulfill missions and the requirements become even greater in the next decade. The potential personnel benefits may be more difficult to realize and are handled separately.

TABLE 4-12. ASW

ELEMENT	COST FACTOR	REMARKS
Present Cost of Fuel/Ship	59,604	10 days operational training 10 days/ship x 24 hours/day x $229/hr = Transit Cost 4.5 days/ship x 24 hr/day x $43/hr = 54,960 + 4,644 = 59,604
Ship Days	228	19 days x 12 ships
ASW Total Fuel	715,248	$59,604/ship x 12 ships
Personnel	38,532	169 man crew x 19 days x 12 ships
Reduce to 9.5	19,266	169 man crew x 9.5 days x 12 ships

Table 4-13 shows the potential benefits in personnel as a result of the implementation of the ship simulator in the training system. Again the benefit is realizable only if the personnel are used elsewhere. The future projections on USCG needs indicate that these personnel would be utilized elsewhere, thus making the benfit realizable.

The reductions in personnel from the present training system more than offset the potential increases in personnel for the new training system. Thus, when the 32 instructors provided to support REFTRA are reduced to 16 and some of the liaison officers are relieved of their present assignments, they provide the personnel for the 20 teaching assignments at the ship simulator school. The crews of the 378 should be reduced as a result of better training in the ship simulator providing 120 man years of available personnel benefit. This is offset by the need to provide 61.5 man years for the attendance at the ship simulator school, the time for the Training Availability school attendance (24.87) and some time remains to provide a benefit of 33.63 man years. The reduction in personnel assigned to the Navy as a result of reduced training there represents a benefit since these people can be reassigned. The personnel that have been made available as a reduction of ship days have been considered in the benefits as a result of those ship day reductions so they are not included here. That total benefit is realizable if the ship days made available by the new training system can be used for operations. Therefore, the crew benefit is not considered in this table since it has been included in the preceding table.

The reduction in crew on the 378's as a result of improved training, i.e., less on-the-job training, should provide the student equivalent billets for the 738 man months of operational training in the simulator plus the benefit of the personnel to be reassigned. This benefit may require further analysis to provide some crew members to be added to perform military operations when needed for training in Condition III, Cruising. A detailed task analysis of present OJT training and the potential reclassification of billets to effect the reduction will be required.

Some of the personnel assigned to the Navy in part payment for the training provided by the Navy would be reassigned. The 13 Aviation and the two Naval War College assignments would remain but 1/2 of the 44 enlisted would be available for reassignment as a result of reduced Navy training supports, thus providing a benefit. Again, this will be subject to coordination with the Navy as the new training system evolves and will require further analysis.

Table 4-14 shows some of the other potential benefits which could result from other alterations in the present operational training system. These alterations to the training system are additions to the 378 simulator. These could include operational training to support 210 WMEC training. This change would have to be evaluated

TABLE 4-13. OTHER POTENTIAL BENEFITS - PERSONNEL

PRESENT TRAINING	NUMBER OF PERSONNEL	NEW ASSIGNMENT	BENEFIT MAN YEARS	ANNUAL-IZED COST	NET PRESENT WORTH *	REMARKS
REFTRA	32	16				32 Officers - Reduce 50%
Navy Liaison (Norfolk, GITMO, etc.)	7	4/20				Teaching staff - ship simulator
Reduce 378 enlisted crew ten men	120					6.4% reduction of crew; 10 x 12 = 120
		61.5				738 MM training = 61.5 MY training
Training Availability		24.87	33.63	.5465	3.358	33.63 x 16.25K/year 546.5 x 6.145 = 3.358
Personnel Assigned to Compensate for Navy Training	59		22	.357	2.196	22 x 16.25K/year 59 billets 13 Aviation, 2 NWC, 44 enlisted
TOTAL			55.63 MY		5.554 Mil	

* Net present worth based on capital recovery factor of 6.145 for ten years at 10% rate of return in millions of dollars.

TABLE 4-14. FURTHER AREAS FOR BENEFIT CONSIDERATION

PRESENT TRAINING	ANNUALIZED COST (MILLIONS)	NET PRESENT WORTH * (MILLIONS)	SHIP DAYS	PROBABLE BENEFIT NET PRESENT WORTH * (MILLIONS)	PROBABLE AVAILABLE SHIP DAYS	REMARKS
Reliance OCS	.169	1.036	36	1.036	36	Send OCS Candidates to ship simulator. 1376 operate + 3333 depreciate = 4709 x 36
Cayahoga OCS	.178	1.093	78	1.093	78	55K fuel and maintain + 123K instruct/crew
Training Availability - 210	.351	2.160	74.6	1.080	37.3	7 x 2/3 day/yr x 16 ships x $4709/day - reduce 50%
REFTRA 210	.703	4.321	149.3	2.160	74.7	14 x 2/3 day/yr x 16 ships x $4709/day - reduce 50%
TOTALS	1.401	8.610	259.96 +78	5.369	148 +78	

Probable ship-year savings = 148/180 = .82 ships

Probable benefit to offset simulator training = 5,369

* Net present worth based on capital recovery factor of 6.145 for ten years at 10% rate of return.

further to determine its detailed implementation and cost. Such changes have not been included in the implementation plan since they require further additions to the simulator programs, analysis of the 210 training requirements and definition of the training scenarios to provide training for the 210 cutter.

These preliminary results show that a training system modified to support 210 crew training with simulators would be cost beneficial. With this simple analysis, measuring only those alterations, we can be assured that a detailed analysis undertaken to provide a budget for the follow-on plan would result in substantially reduced annual budget figures for training of the 210 crew as the training system is modified.

The predominant benefit to the USCG as ships and people are made available by modifying the training system is in the capability to perform increased missions without additional ships or personnel. It is assumed from the present plans that these ships and personnel are needed to fulfill the expanding missions of the USCG and, thus, the expected benefits are real.

The benefits for the cadet summer cruise are based on the cost of the 255 cutter days used in 1976. No cost is allocated for the placement of these cadets on operational cutters or for using the excess capability of the ship simulator. This has been done since the cost of the summer cruise program did not assess either cadet travel, cadet pay, or cadet support, and, if included in both, would offset each other.

Table 4-9 shows the detail on the key cost factors for training availability. This data is a summary of the detailed analysis included in Appendix E. The Training Availability school attendance should not use the cutter as a "hotel" since the cost for that far exceeds the expense for sending the men to school for the proper period and billeting them at a hotel. The benefit for this modification to the operational training system is shown in Table 4-10.

The cost for the individual attendance is based on 6468 man days at Navy schools at a daily rate for travel and per diem of $57.69, resulting in an annual cost of $373K which over ten years represents a net present worth of $2,292,000. This net present worth is used in Table 4-10 to offset the potential benefit of $20,032,000 resulting in the net benefit of $17,740,000.

Table 4-11 shows some of the detail of the key cost factors for the REFTRA training presently provided. This data is a summary of the detailed analysis included in Appendix E. The REFTRA for the 378 training should be reduced 50 percent as a result of the implementation of the 378 ship simulator school. Further consideration should be given to having the REFTRA instructors come to the ships rather than bringing the ships to REFTRA at the various Navy facilities.

There are substantial overall efficiencies which can be achieved by saving the cost for ship transit time.

Table 4-12 shows some of the detail for the key cost factors for ASWEX training provided by the present training system. This data is a summary of the detailed analysis included in Appendix E. The ASW training for the 378 should be reduced by 50 percent as a result of the ASW training done in the ship simulator. The present crew of the 378 is supplemented with 15 additional billets in order to provide the crew for the Condition III cruising during these exercises. The exercises are also run with the turbine engines and thus are extremely costly in fuel consumption. The ship simulator provides training for operating the turbine engines as well as the ASW sensors to provide the fidelity for the ship system required in these exercises.

4.4. ESTABLISHMENT OF IMPLEMENTATION SCHEDULE

Implementation of the simulator system will require 21 simulator configurations listed in Table 3-3 to establish a simulator training program as outlined in Appendix A. The Implementation Plan will attempt to optimize the methods and sequence of procurements used in building up the training system.

The Implementation Plan will also account for the necessary study and planning tasks involved in reorganizing the training system and the generation of the lesson plans, training scenarios and evaluation criteria required in establishing a dynamic training system incorporating the new simulator training approaches.

With the definition of the simulator configurations to work from and the establishment of their value compared to the value of present training approaches, it then becomes necessary to select a logical sequence in which to procure the ship department simulators. Several questions in the questionnaire provide some guidance to the build up of the total ship simulator. Many ship departments work together to perform specific missions and the order in which system elements are procured to perform multiple department training exercises will influence the final selection.

The best selection for the order in which to implement the simulator subsystems for the training in the ship simulator by departments developed for this study is as follows:

(1) CIC-Surface Search
(2) CIC-Air Search
(3) Bridge
(4) Communications
(5) Engineering
(6),(7) Engine Room
(8) Navigation
(9) CIC - ASW
(10) CIC - EW
(11) All Departments

This order was selected after the Damage Control, Gunnery and Maintenance exercises were eliminated since ADC considered them to be best trained in Navy Schools or OJT. The next modifying factor was based on simulator utilization, recognizing greater cost effectiveness in certain departments over others. The third factor considered was the development of departments in the order that would allow the ten multi-department scenarios to be operated as early in the development as possible to provide some team/mission training.

4.4.1 Coast Guard Inputs

Before implementation of the new training system by the Coast Guard is undertaken, more analytical effort must be undertaken to provide the push to make the necessary changes. The evaluation accomplished in this study indicates that present training methods are not fully meeting the requirement to provide a properly trained, operationally ready organization. Our evaluation has looked at resolving this with the application of simulators to meet the need where it appears to be economically desirable. The use of simulators is definitcly indicated.

There is still the need to refine the details of which functions can be taught in the simulator most efficiently and which can only be taught on-the-job or with the ship in key exercises. The use of simulators will not eliminate on-the-job training, nor operational exercises; it will supplement them. A complete analysis of the economic benefits of this type of training implementation will be dominated by the changes in operation and training which are implemented as a result of the use of the simulator training.

The beneficial results in the form of reduced crew, increased efficiency in performing tasks, increased cutter operating days and greater safety as well as in more efficient training do not stand alone. Each of these factors affect many Coast Guard groups. ADC recommends that in order to obtain these benefits, an analysis of the total Coast Guard training system and operating system be undertaken to synthesize a model demonstrating how the Coast Guard would operate with the implementation of the simulators. This model can be used to provide data to the various groups within the U. S. Coast Guard that must be affected by the changes.

With this model, the benefits to be derived through the implementation can also be quantified in greater detail, providing support for the changes. We have reviewed some of these benefits in a simplistic sense to establish the logic to the recommendation. A more detailed cost/benefit analysis will take into account more specific functions such as:

Definition of the level of training required

Time cost of money

Actual conversion of the training

Training system effectiveness

Actual transfer of people

Actual reallocation of ship usage

Actual reassignment of personnel assigned to Navy

The analysis should go beyond the simple salary and operating cost analysis and get closer to the true costs for operating ships or providing personnel. The overhead costs associated with these operations have been ignored in our analysis. The ship costs should include cost to supply, dock, fit, refit, etc. The personnel cost should include their overhead such as recruiting, training, retraining, pensions, etc.

The additional benefits of reduced personnel, since it is becoming harder to recruit qualified personnel, should also be considered. All organizations have difficulty getting qualified people. The future assessments of the USCG roles and missions indicated the need for more and better trained people as well as more ships with more missions. The problem tends to compound in an evaluation where the future impact is to be considered.

4.4.2 Other Inputs

The recommendation to provide a complete ship simulator including all departments certainly represents a new approach to training. Present maritime simulator training systems are generally operational (Bridge-Radar/Navigation-Engine Room Simulators) and single function or team training (CIC, ASW, etc.), usually for single departments.

Using both these approaches in a modularized set of simulators (10 departments) and providing the capability to put these simulated departments together to make a total training system for the combined departments certainly seems logical and economical following our analysis. This represents the closest analogy to the team training provided in OJT, REFTRA and ASWEX.

The experience in maritime and aviation training provides a foundation for measuring the efficiency in training to be derived through the use of the simulator. Organizations using this type of simulator training can provide hard data to aid in the defintiion of the simulator procurement specifications, the definition of the training scenarios, and the lesson plan outlines to be used in the training system.

4.5 ASSUMPTIONS AND DEFINITIONS

One major assumption in the simulator training analysis is in the utilization of the facility. This assumption can be validated as follows. First, how much training have we assumed could be done? There are 21 configurations of the ship simulator representing ten ship departments. The facility is expected to perform 101 basic REFTRA scenarios and 84 lesson plan scenarios from USCG 415 Training Afloat. Several of these scenarios are expanded to be performed as individual department scenarios, as multiple department scenarios and as total ship scenarios, resulting in a total of 505 scenarios.

If we review Table 4-15 we see that there are 212 scenarios for single departments, 142 scenarios for two departments at a time, 82 scenarios for three departments at a time, 22 scenarios for four departments at a time, and 47 scenarios for the total ship. The grand total of 505 scenarios means that training a full crew would take substantial time. The 212 single department scenarios would be run simultaneously, ten at a time (generally, procedures training). If they took an average of two hours, this would represent 42.4 hours on the facility.

The 142 dual facility scenarios could again require two hours each and could be run five at a time. Thus, 142 x 2/5 = 56.8 hours of facility time. The three and four department scenarios would be run also in two hours average and would be run three at a time. Thus, (82+22)2/3 = approximately 69.33 hours of facility time. The 47 scenarios would also take a two hour average time with 100 percent use of the facility or 94 hours of facility time. The total of this is 262.5 hours and the facility has 344 hours of usable time per month. This represents 3/4 time utilization of the facility which certainly allows sufficient time for transitions of classes between scenarios and other supplemental training efforts as outlined in Paragraph 3.4.4.

If we conclude that a class of students is handled every month, it would have to match the usage for the WHEC training. There are twelve WHEC 378's; there is a crew turnover every two years. There is a three-shift operation for the 41 trainable crew members so there are 12 x 41 x 3 / 2 = 738 students per year to be trained. The school would train about 61 per month for the 378 crew turnover. The assumption for full utilization for the simulator as a two-shift operation seems accurate for the 378.

The best estimate is that the 270 would do the same mission with 2/3 of the crew, and there will be 13 of these vessels. Thus, if the simulator were implemented to train the 270 crew, we can assume there would be 41 x 2/3, or approximately 28 crew members to be trained. There would then be 28 x 3 x 13 / 2 = 546 students per year to be trained, and 45 per month to be trained on the two-shift basis in a 270 ship simulator. The assumption on utilization

TABLE 4-15. 378 SHIP SIMULATOR UTILIZATION

ASSUME TWO HOURS SIMULATOR TIME PER SCENARIO
TOTAL FACILITY TIME (2 SHIFTS) = 344 HOURS/MONTH
TOTAL INSTRUCTOR TIME = 20 x 8 x 4.3 x 5 = 3440

OPERATIONS	SIMULATOR TIME		INSTRUCTOR TIME
212 SINGLE DEPARTMENT SCENARIOS RUN 10 AT A TIME FOR TWO HOURS EACH =	42.4 HRS x 10	=	424 HOURS
142 SCENARIOS TWO DEPARTMENTS AT TIME, RUN FIVE AT A TIME FOR TWO HOURS EACH =	56.8 HRS x 5	=	284 HOURS
82 THREE DEPARTMENTS 22 FOUR DEPARTMENTS			
104 SCENARIOS RUN THREE AT TIME FOR TWO HOURS EACH = (USE TWO INSTRUCTORS)	69.33 HOURS x 3 x 2	=	415.8 HOURS
47 SCENARIOS FOR ALL DEPARTMENTS FOR TWO HOURS EACH = (USE FIVE INSTRUCTORS)	94 HOURS x 1 x 5	=	470 HOURS
505 SCENARIOS — TOTALS	262.5 HOURS		1593.8 HOURS

STUDENT UTILIZATION = 262.5/344 = 76% INSTRUCTOR UTILIZATION = 1593.8/3440 = 46.3%

STUDENTS AVAILABLE PER YEAR = $\frac{12 \times 41 \times 3}{2}$ = 738 STUDENTS PER YEAR

FACILITY STUDENT TRAINING CAPACITY 41 x 2 x 12 = 984 PER YEAR

indicates other tasks would have to be performed in the 270 ship simulator.

In addition to the crew members to be trained for each of these ships due to the rotation policies, we should also assume that the Academy cadets would utilize the facility for training, increasing the utilization of either or both facilities. This should provide an additional 305 students to be trained per year.

The second major assumption is that in fact the simulator training planned can provide adequate training to reduce the present training operations as outlined for the cost/benefit analysis. This evaluation will continue as the detailed scenarios and simulator specifications are generated. The final resolutions will not be completely known until the changes in the training system have been made and the effectiveness of the new training system can be measured.

The literature reviewed as part of the study provides adequate assurance that when properly implemented, a simulator training system can substantially reduce the operating training hours. The results have been demonstrated in the aircraft industry and the data for marine training is still being generated. Devices similar to all of the ten ship department simulators are being employed in training systems for Navy and maritime applications.

The third major assumption is that the ship days and personnel freed by the changed training procedures can be utilized elsewhere. The projections on new ship acquisition certainly show the need. The projections on expanding operations due to the 200-mile limit and studies on the future roles and missions of the U. S. Coast Guard leave little doubt that these resources are sorely needed.

4.6 SUPPLEMENTARY FACTORS

In the planning for training with simulators there are many factors which make training with simulators attractive to the USCG. These factors do not always show in cost benefits but they provide significant push toward using simulators for training.

In addition to these factors, there are other responsibilities in the USCG basic organization in both regulation and research which make simulators valuable to the total organization. We have not attempted to quantify these factors, but they are presented here to provide a complete picture for later consideration.

4.6.1 Projections

The projections which have been made which impact this study require further consideration in the following areas. First is in the quantity of ship types which have been evaluated for training in the simulators. The analysis of the 378 WHEC cutter assumes this class will remain in service to the end of the 1980's with the same general mission, and the same complement of electronics.

The twelve 378's presently in service could be refitted to obtain some of the crew advantages derived from the COMDAC system as planned for the 270 cutter. The same could be true for the other large cutters in the present USCG inventory. This would shift all the emphasis in simulator training to that type of simulator. It could necessitate the procurement of two COMDAC type simulators to meet the total training needs.

The 378 ship simulator could also be used to provide training for the crews on the 210, 255, WLB's/WAGO's or WAGB's. Our present analysis has not quantified the potential training scenarios or simulator modifications required to meet these needs, but since there are ship (Bridge) simulators which provide a platform for training several different ship types, we can see how this simulator could be configured to accomplish training for other ship types or missions as well as for the 378.

The full impact of the projections of ship type, ship equipment and ship missions and training requirements will have to be evaluated. The results of those evaluations can be fed into the total consideration before a final budgeted/implementable follow-on plan will be established by the USCG.

4.6.2 Marine Community

The total marine community is being impacted by the training problems associated with higher automation and smaller crews. This is true in the maritime community, particularly for the VLCC and LNG ships whose maneuvering characteristics coupled with their dangerous cargo, is forcing these people to look to simulators as opposed to on-the-job training for safety reasons.

The economics of the commercial operations provide greater automation in the ship operations allowing reduced crews. This leaves the crew little opportunity to learn how to operate the ship should the need arise. The crews have little opportunity to operate without the aid of the sophisticated automatic systems. Simulator training is being used to provide that opportunity without undue risk or loss of efficiency in operation.

The Navy is also going more toward simulators for training, again due to highly automated ships with smaller crews. We would expect this trend to continue. The Navy is also evaluating pipeline training systems by ship type and/or mission. There are efforts underway to expand simulator training in the Navy in Navigation, Damage Control, Fire Fighting, etc.

The U. S. Coast Guard interacts and responds to both these events. First, they serve a regulatory role for the U. S. maritime community and, as such, require more awareness of training, qualification and requalification with simulators.[19] The U. S. Navy provides much of the training to the USCG, particularly for the military missions, and as their training policies shift, the availability of training to the USCG will shift as well.

Should the basic Navy approach to training shift as a result of their new ship types, some of the training schools which the USCG now uses may not be available. The USCG would have to then provide their own training or eliminate the support to the Navy.

4.6.3 Coast Guard Personnel

The USCG should reconsider their present assignment policies. The questionnaire demonstrated considerable lack of effective training OJT due to these assignment policies. Longer tours in seagoing duty, more specialized training or other considerations should be given to the present policies to improve this situation.

In the complete consideration of the training system, we have assumed that the present policies or personnel would remain the same. Substantial overall efficiency in training could be achieved if the present policy were altered, and it should be considered in future studies.

4.6.4 Fuel

The impact of fuel on training in the next decade could be substantial. Simulators don't use fuel for training, and ships do. The availability, cost and national policies concerning this commodity can shift the fuel availability. By using simulators for training as opposed to ships, the available fuel can be allocated to operational missions. This shift in emphasis from Fleet Exercises, REFTRA, Training Availability and on-the-job training to training with simulators can assure the USCG of continued training to meet their requirements.

4.6.5 Ship Acquisition and Usage

The consideration of ship acquisition and usage for this study have assumed that:

The USCG missions will remain the same.

The ship usage and types will remain the same.

The 270 will be procured.

The 270 schedule will deliver 13 ships starting in 1980.

Some of the present studies under contract by the USCG indicate that these assumptions could be conservative. They indicate that the missions will expand and that the usage will expand in the next decade. Both of these factors would place a greater strain on the training requirements, the number of ship days needed, and the personnel requirements.

4.6.6 Other Agency Impact

Recognizing the potential of the Navy altering its training approaches due to automated ships, more simulator training and constraints on their usage of fuel, the potential exists for this to impact on the U. S. Coast Guard training. For this reason, as well as operational training costs, the ASW and EW departments have been considered in the development of the 378 simulator. The implementation of these two functions should be decided, based on the development of the Navy plans in the next several years.

The 378 simulator and the COMDAC simulator have not been considered for providing training for either LAMPS or the NTDS system or other weapons or fire control systems. We have assumed the Navy would continue to provide that training as required.

We have not looked at Damage Control or Fire Fighting since the Navy either has or is planning substantial training using simulators that would be applicable in those areas. Several scenarios of this type have been briefly considered and that type of training could be incorporated in the scenarios for the USCG ship simulator where all ship departments are involved should it become necessary.

MarAd as a result of the development of the CAORF facility at Kings Point could provide support to the USCG in the development of training approaches and training evaluation during the development of specifications for simulator procurement or scenario development.

4.6.7 Potential for Increased Operation

Within the scope of the study, the 378 ship simulator can be considered for the following additional usage:

(1) Expand facility to train 210 crew

(2) Train 170 OCS students per year

(3) Train some of 720 Reserve personnel per year

(4) Expand facility to train other ship types as well

(5) Usage for USCG non-training purposes

The simulator can certainly be used to train the Academy cadets as part of the summer training program. This would supplement the at-sea time provided on the operational cutters. The additional student load would be handled by allocating some observer time and some hands-on training time. The opportunity to allow the cadets to practice in all of the stations on the ship would probably be invaluable.

This cadet would require some scenarios generated to support their training to maximize the training benefits they would get. It would require proper scheduling to fit the Academy schedule and their summer cruise schedule,but it should not require additional cost to be considered for the ship simulator.

The expansion of the simulator capabilities for training the 210 can also be considered as cost effective. The detail has not been worked out within this study to determine the simulator requirements, training scenarios, etc., but they are logical extensions of the present work.

The probable student mix for the 210 is analyzed as follows:

Present crew - 62
Crew to Train - 45 (15 x 3 shifts)
16 ships x 45 = 720 per 2 year period
i.e., 360 per year based on present rotation schedule

$$\frac{\text{360 students/year for 210}}{\text{738 students/year for 378}} \times 3150 \approx 1575 \text{ hours/year}$$

Table 4-16 takes a look at the time loading that this could represent. The previous analysis for the 378 (Para. 4.5) cost benefit analysis was based on a two-shift operation. Present ship simulators require less than four hours of maintenance per day so that represents a good estimate for maintenance time. The 378 ship crew training is 3150 hours. The 210 crew training should represent no more than the 1575 hours with the cadet training representation approximately the same. The additional 1,000 hours for R&D or other students would probably not be available being used up on vacations and holidays. There is sufficient time available that a detailed analysis should be undertaken for providing 210 crew operational training in the 378 ship simulator.

TABLE 4-16. INCREASE UTILIZATION - POTENTIALLY GREATER COST BENEFITS

4 hours Maintenance per Day	1460 hours
378 Training Usage - 262.5 x 12	3150 hours
Expand for 210 (360 students/year)	1575 hours
Academy Cadets - 305/year	1575 hours
R&D, or other Students	1000 hours
365 x 24 hours = Per Year	8760 hours

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SECTION 5

STUDY RESULTS

5.0 RESULTS

The study efforts clearly indicate that simulators should be incorporated into the U.S.C.G. training system. The effort on the training for the 378 clearly indicates that the development of a simulator for that ship type is cost beneficial.

The study methodology developed in this effort provides a foundation to build on for the development of the training system and the data to effect the desired changes. The establishment of the data bases for this study provide the foundation which can be expanded to detail the requirements for the implementation of the follow-on plan.

The analysis of the present operational training system correlating REFTRA and ASW exercises with Training Afloat, STD, etc. can be expanded to include Formal Training, Training Availability, etc. to provide total training by ship, mission, and personnel. The training system can then be established against the mission requirements and ship type to define pipeline training systems to meet the training needs of the U.S.C.G. in an efficient manner. These pipeline systems can and should be continuously evaluated to measure the capability of the training system to adequately meet the training needs.. This study effort has already indicated that in several areas the training needs are not being met by the present system.

The analysis to determine the equipment used to perform operations and missions on the ship demonstrate some substantial training problems. ADC reviewed the equipment complement for the WHEC (378), WMEC (210) and the proposed 270. This evaluation showed a large mix of equipment types available on the ships. From a training point of view, this requires expanded training needs and must be evaluated to provide proper training to meet that need. The U.S.C.G. might well consider reducing the number of equipment types they use, reducing the training problems and providing other overall benefits to the U.S.C.G.

The analysis to establish the simulator requirements provides outputs for further study in the development of the implementation of the follow-on plan. First the basic requirements for the simulator specification have been established and can be expanded. Second, the correlation of these requirements with the training scenarios have been established and can be expanded to generate the final

training scenarios. Third, the areas where no training can be found to meet mission requirements can be identified and training scenarios to fill these needs can be generated.

The analysis of the simulator capabilities and cost generated for the cost benefit analysis provide the data base for the generation of budgets required in the implementation of the follow-on plan. This effort has included consideration of potential sources to supply the simulators, meet the instructor requirements, provide the maintenance requirements as well as correlating these simulator configurations with the trainees, the training scenarios and the equipment requirements.

The present study did the cost analysis for future training in a simplistic fashion. With the development of a detailed time phased implementation plan this approach can be expanded to consider the true cost of money as well as the allocation of operation and maintenance costs.

The analysis of the present training system necessary to generate the cost data for the cost benefit analysis provides a data base and methodology for further evaluation of the present training system. The present training system will, of necessity, be modified as a result of the implementation of the simulators and trade-offs will continue to be made to establish the new training system incorporating the simulators to provide a cost effective and training efficient system.

The approach to compare costs of the training in terms of the cost of hands-on student training hour provides a quick method to obtain a first level of evaluation. This type approach can be used to describe where to put future investment before making the more difficult assessment of how effective either of the training methods is.

The cost benefit analysis makes several assumptions in terms of both implementation and conversion. These assumptions must be measured in depth allocating training to an approach both by mission and by lesson plan as well as training method. This analysis should also be expanded to take into account the detail of the actual implementation plan. This again requires the true cost of money to be considered as well as the allocation of operating and maintenance cost.

The review of the simulator manufacturers (Appendix B) provides substantial information on the capabilities, cost and probable development of the desired simulators. Several seminar questions were devoted to establishing future cost/capability. This data could not be factored into the cost analysis. There can be some reduction in

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A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY--ETC(U).
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the simulator cost as a result of this; however, trying to project for some 60 manufacturers into the future is probably not worth the effort for this study's assessment. The data base represented by the manufacturers present capability provide significant insight into the determination of cost to acquire the devices and that data has been used in the development of the simulator configurations cost/ capability analysis.

The questionnaire as well as providing us with clear paths to follow by measuring the effectiveness of the present training system also provides a data base to start the detailed planning to reorganize the training system to incorporate better training approaches as well as simulators.

This data base can be further analyzed to provide guidance to the determination of:

- Where efficiencies could be implemented in the present training approaches.
- Which training approaches (other than simulators) could be expanded and which reduced.
- Where training is not being provided in sufficient depth to meet the needs.
- Where overtraining is provided resulting in inefficiency.
- How an effective training measurement system could be created.

One of the approaches to consider in the development of the training measurement system is the type of feedback obtained from REFTRA. The capability of the ship and its crew to demonstrate, underway, their ability measures both the crew performance and the effectiveness of the training system. The U. S. Coast Guard should consider measuring their performance in this manner - except have the examiner go to the ship not bring the ship to the examiner which is far more cost effective.

5.1 CONCLUSIONS

The conclusion to add simulators to the present training system to increase the readiness of the U.S.C.G. did not determine to eliminate any of the present training approaches presently used.

Appendix A, Implementation Plan for Simulation Training Systems, does show an evolutionary approach to the implementation of the simulators and the modification of the training system. The present analysis anticipates reduction in effort in four operational training areas as

a result of the use of the simulators. It is anticipated that both the detailed analysis to follow and the feedback to the training system will define in detail how this reduction comes about. We also anticipate that others areas of the training system will be made more cost effective where the simulator training is correlatable to the training provided and further analysis shows how it can be implemented.

Our present analysis also concludes that the present operational training system has several deficiencies. This was indicated in our analysis of the training system and was confirmed by the questionnaire. Basically there are several mission training requirements which are not being met by the present training system. The reduction of the questionnaire data demonstrated lack of readiness in those areas and wide diversity in the capability to perform the missions. This wide diversity of opinion in those areas is to be expected if the training is done on the job without guidance. Thus some will be trained well and some will be trained very badly.

The reduction of the cost data in the present training system indicates a first measure of the cost efficiency of that training. That cost efficiency is obtained in three ways. First, through utilization of the facilities if there are any. Second, by the utilization of both instructor and student time. Third, by the reduced use of the ship for operational training, transit or as a hotel.

The further analysis of the training system should continue this evaluation potentially shifting the training emphasis to achieve greater utilization resulting in higher overall U.S.C.G. training efficiency.

5.2 RECOMMENDATIONS FOR IMMEDIATE ACTION

The recommendations for immediate action are:

- Begin the planning to have cadet training done on operating ships instead of on dedicated ships.
- Begin the scheduling of Training Availability individually instead of by total ship.
- Begin the planning for the implementation of the 378 ship simulator.
- Begin definition of the COMDAC training requirements for simulator training.
- Begin the evaluation of the small boat training using a trailerable simulator.

5.3 RECOMMENDATION FOR FOLLOW-ON ACTION

Appendix A outlines recommendations for future action, however, there are several areas to keep under consideration. Substantial impact in the future can occur as a result of certain events and although we did not factor these into the analysis, they require continued evaluation and reevaluation.

Some of the possible events to consider are:

- Impact of the 200 Mile Limit on Operations
- National Policies on Fuel
- Navy Training Policies Particularly Their Support to the Military Operations
- The Development of New Systems/Ships
- The Potential Life, Use and Modifications of Present Systems/Ships
- The Potential of the Non-Training Uses of the Simulators.

A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY BE EFFECTIVELY APPLIED TO THE ACCOMPLISHMENT OF COAST GUARD VESSEL OPERATIONAL TRAINING

CONTRACT DOT-CG-61814A

APPENDIX A

IMPLEMENTATION PLAN

FOR SIMULATION TRAINING SYSTEMS

PREPARED FOR

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April 30, 1977

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APPENDIX A

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APPENDIX A

IMPLEMENTATION PLAN FOR SIMULATION TRAINING SYSTEMS

A.1 INTRODUCTION

This Appendix develops, based on the data analysis and conclusions reached in the study, a follow-on plan for implementation of a training system encompassing simulation systems. The underlying requirement for this approach to U. S. Coast Guard Operational Training is the necessity to decrease substantially the utilization of operational cutters for the sole purpose of dedicated team training. The following paragraphs describe the primary considerations to be addressed in assuring successful and effective implementation of this approach. Figures A-1 through A-6 provide an overall schedule for accomplishing these goals.

A.2 RESPONSIBILITIES

A. Headquarters Staff

This activity shall provide overall direction to implementation of the follow-on plan which encompasses operational training throughout the Coast Guard. As indicated in the figures, substantial preliminary work involving training analysis, simulator hardware and software definitions and detailed implementation schedules and management are necessary to respond successfully to the training requirements of the 1980's.

B. Coast Guard Academy

The Academy, and particularly the Department of Nautical Science and Law, should improve the capabilities of cadets in the area of professional and military job readiness. Figure A-5 depicts a proposed plan schedule for the evolution to an expanded training system incorporating fully instrumented T-boats and classroom training aids and facilities centered around actual shipboard navigational equipments.

C. Research and Development

R&D involvement comes under the heading of non-training uses of the simulator. Evaluation of this potential is provided for in Figure A-1. Non-training uses could cover new equipment evaluation, human factors studies, procedural techniques analyses relative to specific on-board operations, Rules of the Road scenario studies, etc. The nature and scope of such activities would require definition and a coordinated scheduling effort with the activities responsible for simulator training. Various of these potential non-training uses are described in the following paragraphs (a to j).

FIGURE A-1. OPERATIONAL TRAINING IMPLEMENTATION PLAN (Part 1)

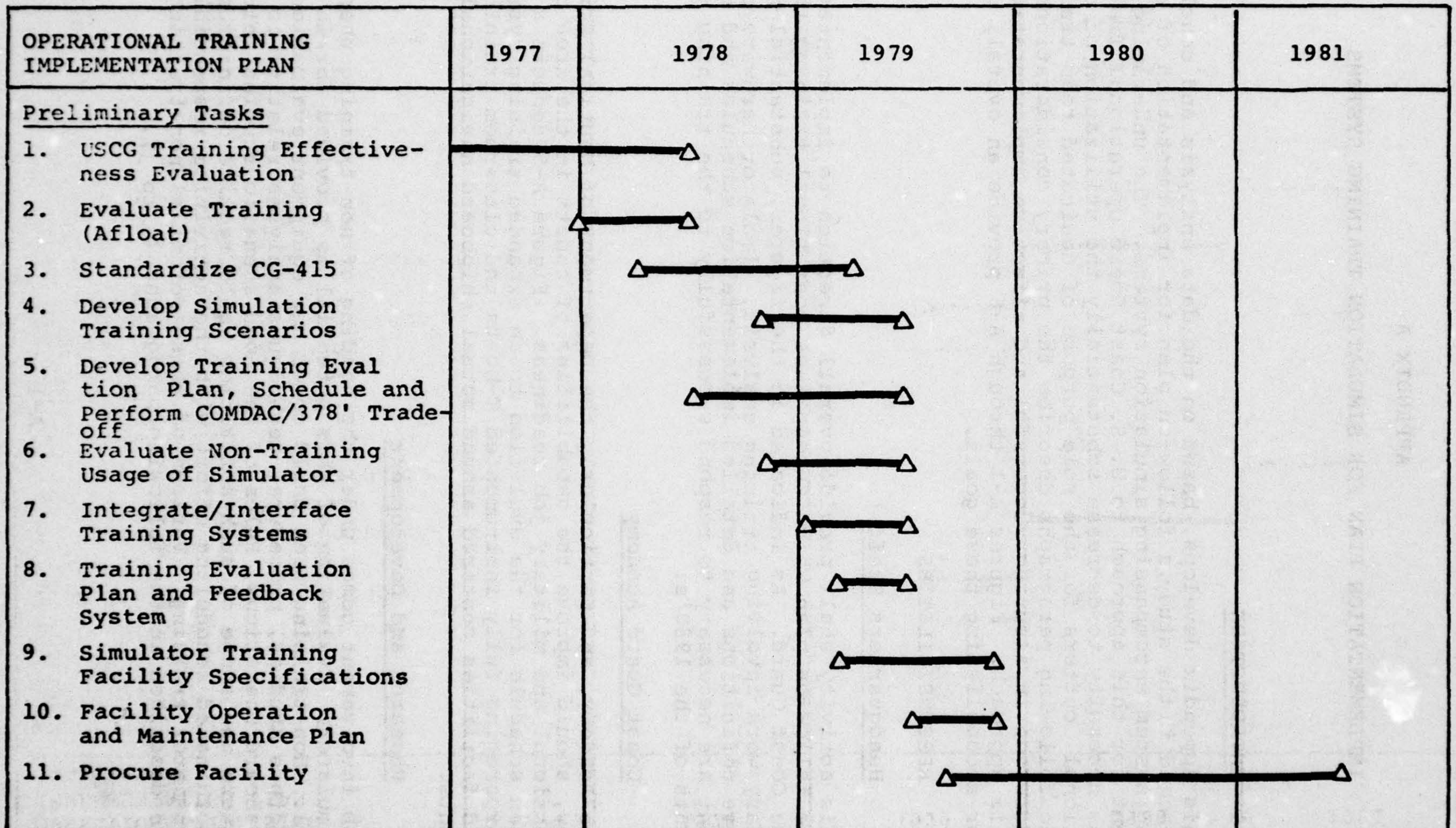


FIGURE A-2. OPERATIONAL TRAINING IMPLEMENTATION PLAN (Part 2)

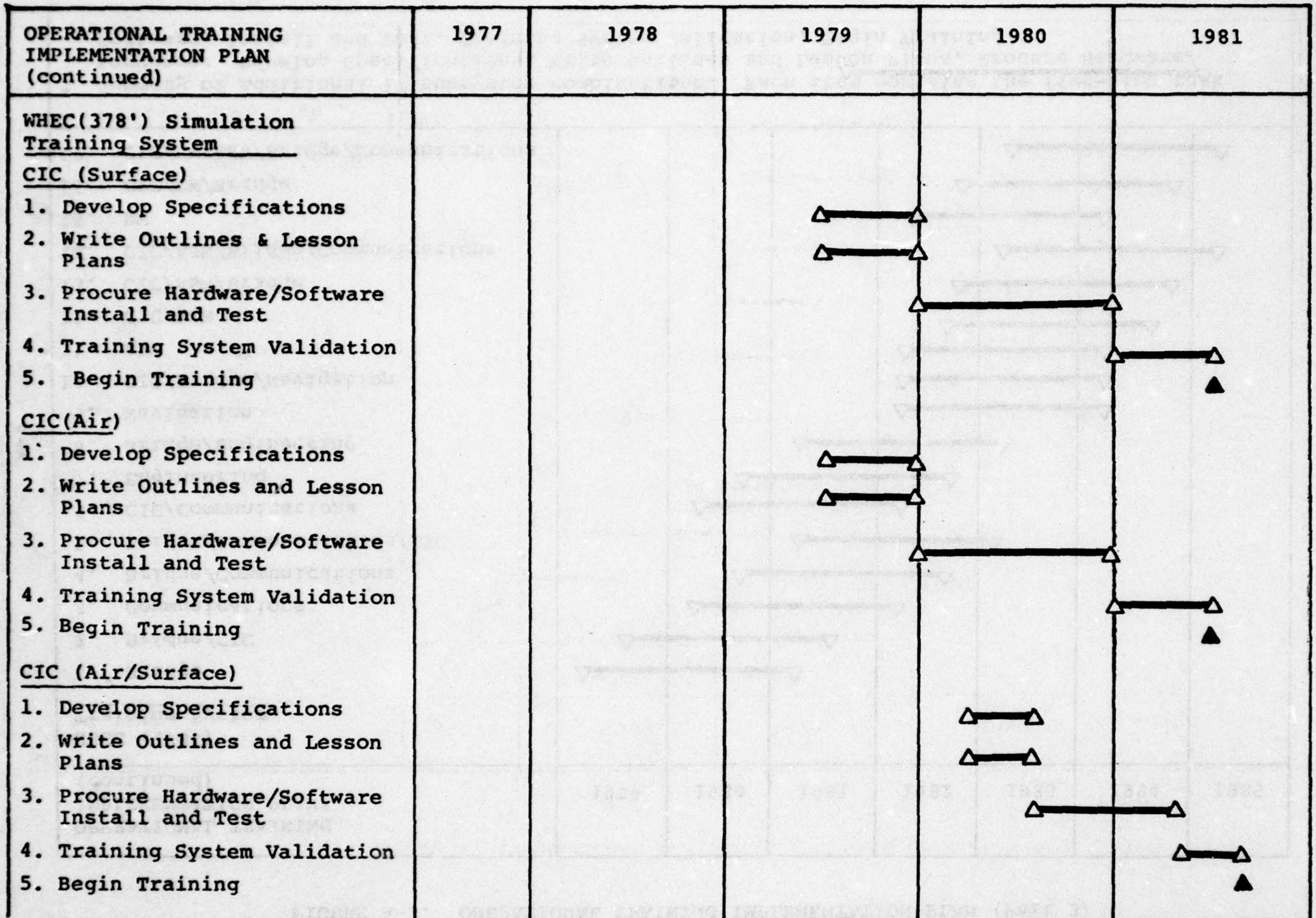
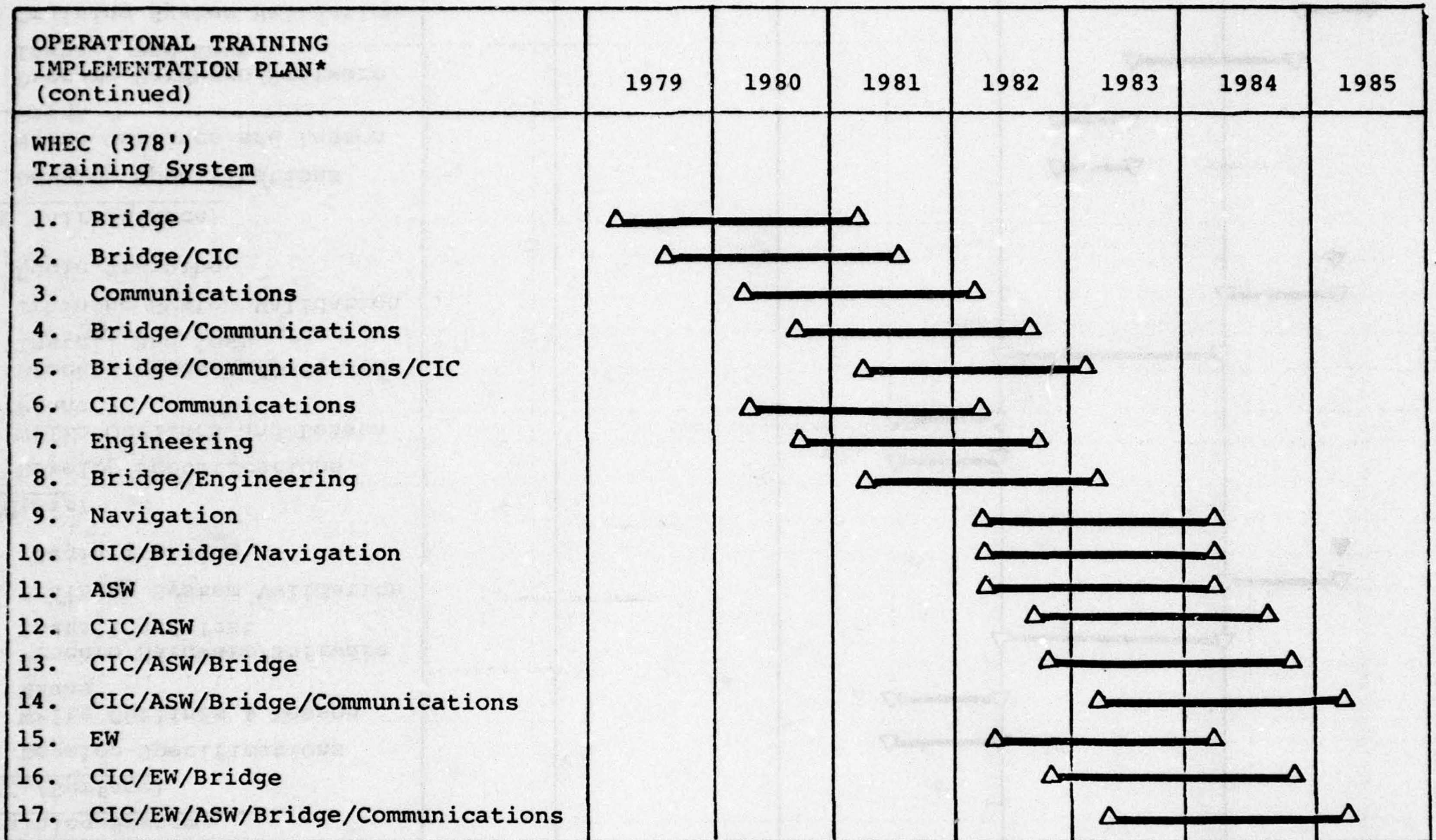


FIGURE A-3. OPERATIONAL TRAINING IMPLEMENTATION PLAN (Part 3)



* Summary of additional 17 subsystem combinations. Each item contains the five-step task sequence: Develop Specifications, Write Outlines and Lesson Plans, Procure Hardware/Software, Install and Test, Training System Validation, Begin Training.

FIGURE A-4. COMDAC FOLLOW-ON OPERATIONS TRAINING PLAN

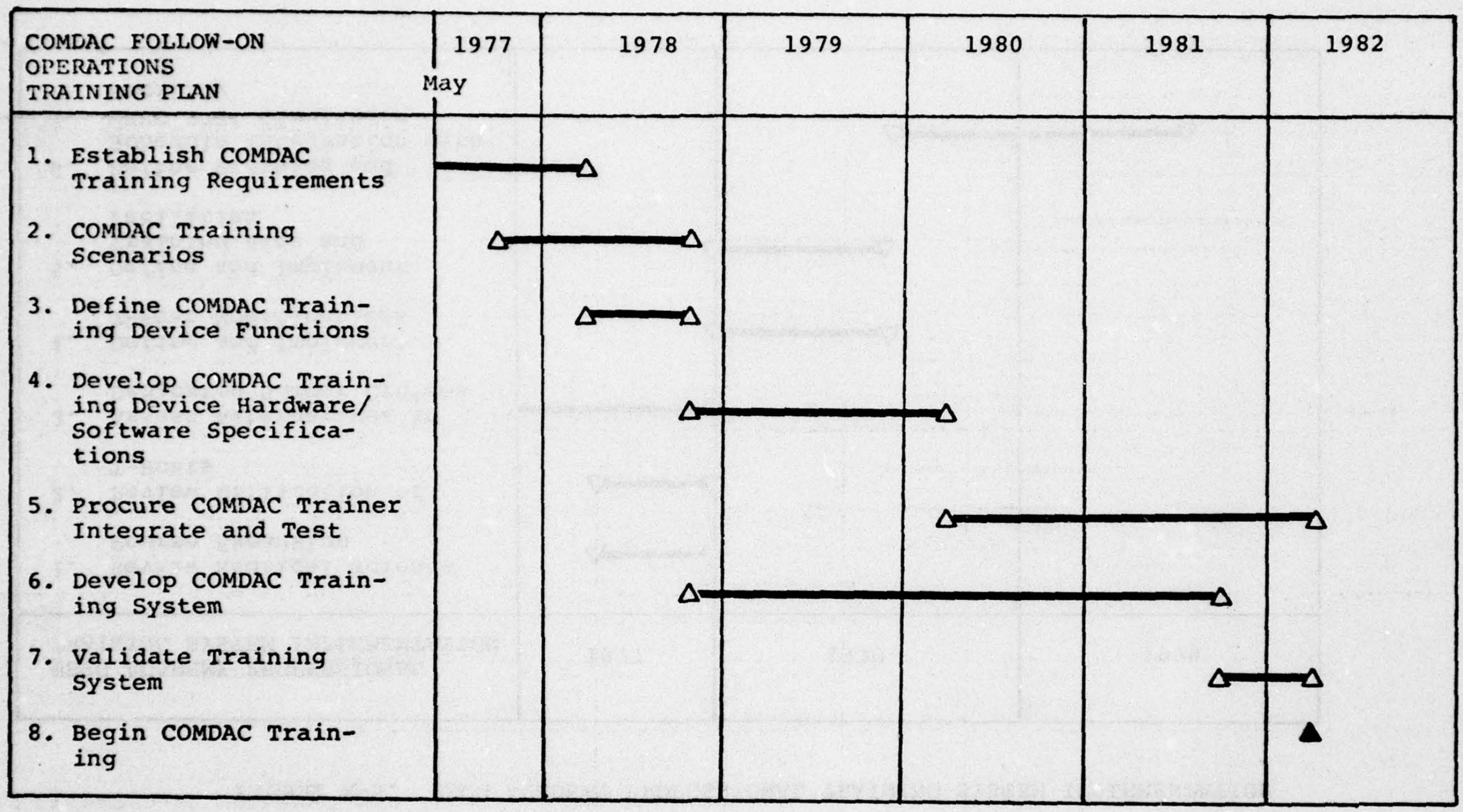


FIGURE A-5. USCG ACADEMY PROFESSIONAL TRAINING SYSTEM IMPLEMENTATION

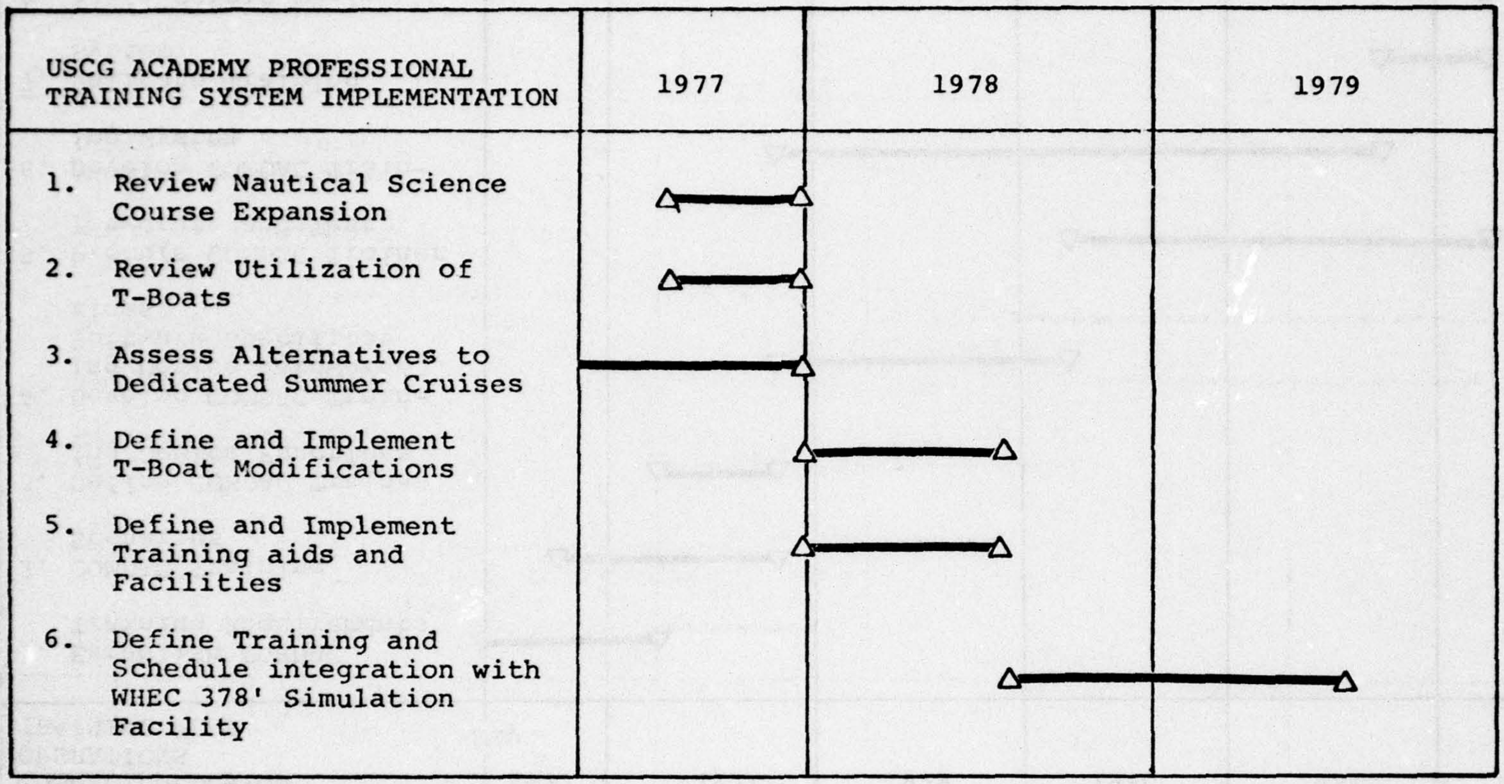
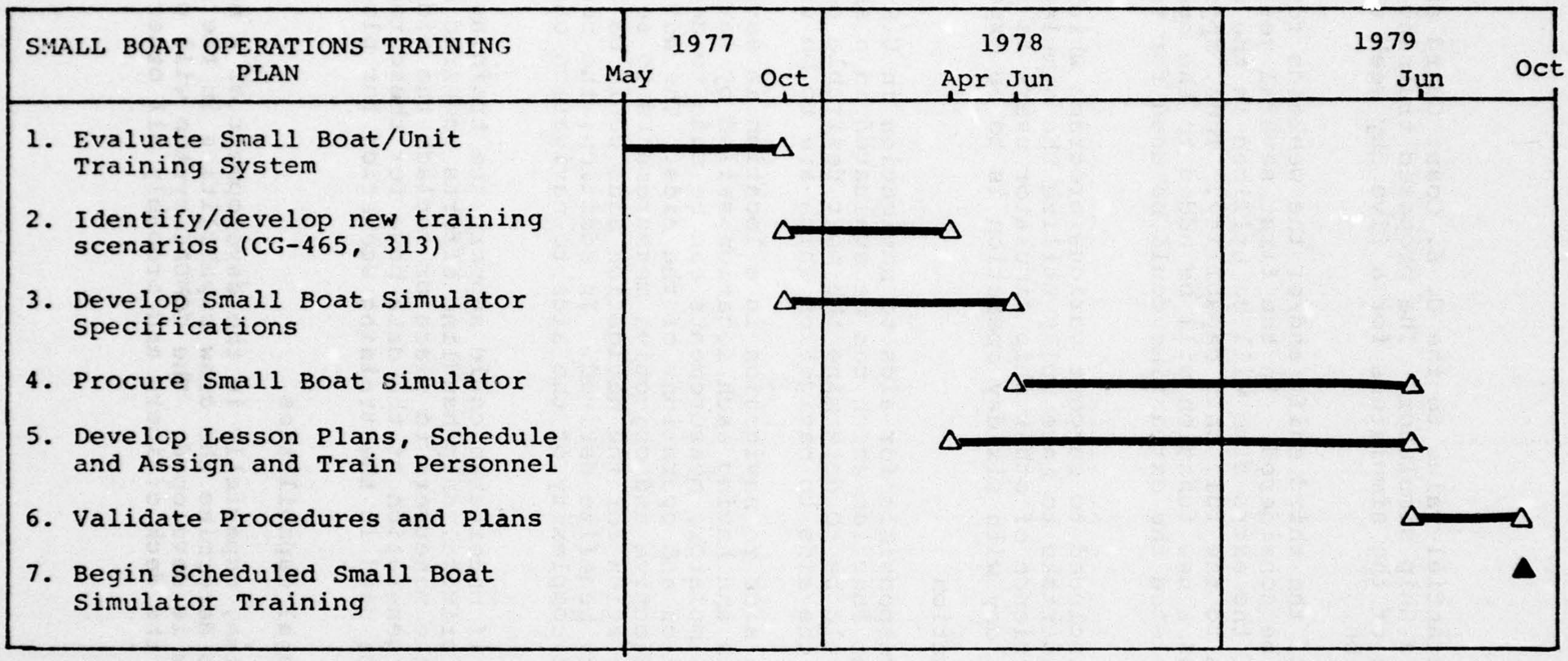


FIGURE A-6. SMALL BOAT OPERATIONS TRAINING PLAN



a. Research

There can be substantial value to the U. S. Coast Guard as an agency to having a ship simulator. The proposed training program is based upon use of the simulators for a five day week using a two shift operation.

The use of part of the third shift and/or the weekends for other functions should be considered. In the first several years of operation some of the extra time will be utilized in the expansion of the simulators to the full ship capability. Thus, approximately every three months a new function will be added to the operation. When this is completed the extra time could be used for these other functions.

This section is included to suggest various programs which the U.S.C.G. could undertake to more fully utilize the simulator facilities. Experience of other ship simulator users is that a 20 hour operating day with six day operation is to be expected.

b. Aids to Navigation

The U.S.C.G. is responsible for aids to navigation in U.S. waters. One very important function which can be evaluated in a ship simulator (Bridge) would be to determine the most desirable position and operation of the aids to navigation which are to be used.

By setting up the aids to navigation in a location in several different patterns and having each location sailed by several captains in the simulator, measurements can be made to determine the optimum location and operations of the aids. The advantage of using both subjective and objective measurements to select placement and operation for the navigation aids could be substantial in the safety benefits derived. In addition, the reduction of the number and complexity of the aids to navigation can be substantial.

This type effort if undertaken could support the training efforts. Some of the more critical ship handling efforts required by U.S.C.G. officers are in the maneuvers to place or replace the aids to navigation. The generation of the data base for these research experiments can be used in the training scenarios for placing aids to navigation.

c. Crew Operational Capabilities

Of particular value, especially in the development of a new system like COMDAC is to determine the crew capabilities in the new system before the system is developed. The COMDAC system will place different stress on the deck officers and probably all other ships

officers and crew since the highly automated/computerized system will represent a substantial departure from the previous method of sailing ships.

Again, the research efforts used in this development provide benefits to the training program for the system once implemented. The data base and test scenario can be used in the training programs to follow.

This type research is not only valuable for a completely new system like COMDAC but has merits in more conventional ships. The operating procedures, equipment used and tasks performed in each of the operating departments on the ship can be evaluated in a simulator of this type to determine more effective operations and equipments.

There has been no opportunity to make these type evaluations in the past and thus it is difficult to assess the benefits that could be derived if they were tested. The determination of man/machine interaction to perform tasks has always been difficult to assess. The design deficiencies due to poor implementation are dfficult to change after they are created. The real world provides an expensive and often uncooperative environment to make the measurements to determine how things should be changed to be more efficient. It is difficult to put a dollar value on the losses resulting from poor decisions nor the benefits to be obtained from better ones.

d. Rules of the Road Evaluation

The U. S. Coast Guard has responsibility for the enforcement of the Rules of the Road. These consist of actually four sets of Rules:

International Rules of the Road
Inland Rules of the Road
Western Rivers Rules of the Road
Great Lakes Rules of the Road

There is the need for definitive measurement of the effectiveness, safety and applicability of these Rules and the opportunity to make objective tests to measure these capabilities (or problems) in a simulator could be very beneficial to this total role.

e. Ship Operation

Much of the analysis to demonstrate improved effectiveness in operation for the use of more sophisticated equipment on ships has been to achieve the benefit of reducing the need for crew. These analyses often do not take into account the need to provide a crew which has undergone more extensive and comprehensive training.

As these new systems are implemented, the training approaches have been modified to meet the necessary requirements. For the considerations in the simulator for the COMDAC system the training system

should and will be planned as the system design is planned. There is no doubt that some economics are achieved in this fashion and the effectiveness of the training will achieve the desired effectiveness of the operation.

f. Safety

Safety in operation has been one of the key motivating forces in the development of simulators for training. The ability to allow the trainees to handle dangerous maneuvers or practice emergency procedures has greatly facilitated the development of simulator training. The safety benefit here is in reduced accidents during the training operations.

The confidence and precision which the trainee can perform the tasks in emergency situations has proven to be the greatest benefit and one of the hardest to assess.

The questionnaire requested an essay answer to two questions for possible scenarios to be run in a simulator. These essay answers provided a wide variety of "sea" stories with dangerous and often unconventional maneuvers used to overcome the geographical or environmental conditions encountered.

These "sea" stories could not be encountered for training in the real world, but many could be reproduced in the simulator. The training value of many would be marginal, but the training value of some would be significant. One thing that comes out of the review of these stories is that the need for this training is significant. The missions of the U.S.C.G. place their ships at sea in the most dangerous waters and the most severe weather conditions and the officers and crew should be trained to handle those conditions.

The second safety benefit is in the reduction of accidents in actual operations. This benefit too is difficult to assess and can only be measured over a long period of time. There is no doubt that human error is one of the largest contributing causes of accident and that if those errors are reduced the benefits can be substantial.

g. Improved Efficiency of Operation

The potential benefits in improved U. S. Coast Guard operation will take years to assess. The diversity of opinion in this area of consideration is extreme as would be expected since most measurements have been made in a changing training environment with a wide diversity of backgrounds in the trainees.

The basic premise in the development of a training system using simulators is that the fidelity of the simulator is sufficient to provide

a positive transfer of training to the real situation. The training system itself, if it is properly integrated, can help to provide this and has been provided with relatively low fidelity equipments in several training systems.

h. Training

The total training system will include formal education, operational training, operational training in simulators, and both on-the-job training and on-ship measurement of performance. The training system should definitely evolve toward the achievement of the total ship simulator trainers. The training system will, during the development of the ship simulator trainer, provide scenarios for the training of departments and multi-department functions.

The complete simulator development will also continue to evolve by the development of improved scenarios, after it has been installed and made operational. This evolution should be forced by the continued evaluation of the training system to meet the changing operational needs of the operating departments.

Perhaps the key benefit of training with simulators is the ability to take the risk to allow unexperienced people to operate the equipment and make decisions. This can compress years of experience into the events which can be made to occur in the simulator in weeks. Dangerous and emergency conditions can be created and the necessary confidence developed in the trainee to overcome these events.

i. Retraining

The ship simulator will also be used for retraining of the officers and crew to provide "job ready" personnel on the ships. The present rotational policies in the U.S.Ç.G. often provide substantial time periods between at sea tours and there is a significant need to provide the retraining prior to ship assignment.

j. Qualification

The qualification of commercial pilots is often being done in simulators and we can foresee where this can become the process in the marine world.[19] The ability to assess the performance of the trainee as well as train in a simulator can also be of substantial value to the U.S.C.G.

There is a substantial responsibility in both lives and money placed in the ships officers. Because of this, the selection process for the officers is and should be done as completely and comprehensively as possible.

D. Operations

This activity has overall responsibility for the development, implementation and management of the simulator training system. These responsibilities are described in Figure A-1 which covers preliminary planning tasks and studies and ultimately the development of a WHEC (378') simulation training system. The preliminary efforts lead, in early 1980, to completion of the facility to house the simulator system and its supporting functions. Each of the preliminary steps leading to this event are, in themselves, complex efforts which will require close supervision, continual monitoring, possible restructuring/redirection and schedule coordination. An important element of these preliminary tasks is the trade-off determination which will establish, based upon the final COMDAC implementation plan, the actual configuration of the simulator. That is, if the COMDAC system will retrofit existing WHEC 378's, in addition to its usage on the 270, then the simulator configuration must take account of such utilization.

The second part of Figure A-2 provides a schedule for the specification, procurement, lesson development and validation of a WHEC (378') Simulation Training System. As shown, the individual tasks repeat for each major combination which is procured sequentially (CIC Surface and CIC Air are procured simultaneously). Although not shown, there are a total of 20 identifiable subsystem combinations within the simulator system and the 21st configuration is the total simulator system itself. The first three--CIC(Surface), CIC (Air) and CIC (Air/Surface)--are followed in overlapping sequence by seventeen additional subsystem combinations, which are:

1. Bridge
2. Bridge/CIC
3. Communications
4. Bridge/Communications
5. Bridge/Communications/CIC
6. CIC/Communications
7. Engineering
8. Bridge/Engineering
9. Navigation
10. CIC/Bridge/Navigation
11. ASW
12. CIC/ASW
13. CIC/ASW/Bridge
14. CIC/ASW/Bridge/Communications
15. EW
16. CIC/EW/Bridge
17. CIC/EW/ASW/Bridge/Communications

The final configuration, the total simulator system, includes all twenty subsystem capabilities.

The foregoing subsystem combinations require the same five-step task effort as shown in Figure A-2 for the CIC combinations. As mentioned, all steps are sequential but overlap considerably such that from the time that CIC (Air/Surface) begins training in September 1981, until all 17 subsequent combinations are implemented, covers a period of four years. That is, the full simulator, with all twenty subsystem combinations is in operation as of mid-1985. Further, each indicated combination does not necessarily define unique hardware/software elements. For example, the Bridge (1) and Communications (3) subsystems are virtually unique, but Bridge/Communications (4) is a combination of these existing hardware/software packages with some unique hardware and software interface for the latter (#4) combination. Thus, although the same five-step developmental task effort is allocated for schedule purposes to each of the twenty subsystem combinations, the scope of many of these tasks is minimal.

E. Personnel

This activity has overall responsibility for the personnel involved in the system. This includes the reallocation of personnel to staff the ship simulator school, reassignment of personnel with the Navy, performance of necessary job task analysis for the ship crew and handling of the functional training to support the operation.

F. Engineering

Engineering has basic responsibility in the development of the COMDAC system and its potential for refitting the 378 for this system. This decision will have a direct impact on the implementation of the 378 ship simulator.

This department should have inputs to the decisions required in Task 5 on Figure A-1, concerning potential retrofit of the 378. This decision is correlated with the training plans outlined for the 270 shown in Figure A-4.

A.3 SIMULATOR APPLICATIONS

In general, there are three simulator configurations under evaluation with a possible tradeoff and combination of two types. These, in turn, are under consideration for four basic applications. The foregoing statements are clarified below:

Simulator Configurations	Potential Applications
WHEC 378	Large Unit (Afloat) Operational Training,
COMDAC	Small Unit Operational Training,
Small Boat	U. S. Coast Guard Academy
	Research and Development

The primary ship simulator is directly applicable to large unit operational training, but depending upon decisions relative to the application/distribution of COMDAC, could be a WHEC 378 or COMDAC simulator of some suitable combination thereof. A small boat system, particularly if mobile, is applicable and appropriate for small unit training and potentially for enhancement of formal training courses such as Yorktown Boatswains Mates' School and OCS. Similarly, the Academy, upon careful review, may schedule either or both simulators into a segment of their training, such as a supplement or partial replacement for summer training cruises and/or Nautical Science III. In summary, applications of simulation training beyond the operating units requires further study to assure proper scheduling and integration into existing courses. Otherwise, such a significant departure from established techniques may cause considerable difficulties leading to non-acceptance of such an application.

The Research and Development application is amendable to the primary simulation device. However, since this is not a training application, the fundamental requirement is for proper coordination and scheduling of R&D routines on a non-inteference basis. Presumably, the individual R&D groups would be authorized to develop research scenarios for approval and subsequent scheduling into the simulator facility.

The acquisition schedule provides for all of the previous contingencies by allowing sufficient time for the completion of preliminary studies. Thus, simulator acquisition, integration and implementation can be accomplished with a significant assurance of success.

A.4 TRAINING AREAS

As indicated in the previous list of 20 subsystem combinations, the basic simulator training system is oriented toward military operations. This approach is considered optimum since such operations encompass virtually all of the operational contingencies encountered while afloat for all classes of cutters. That is, the WHEC or COMDAC military operations mission is "worst-case" in terms of training coverage and all other missions may be classified as subsets. Thus, a team fully proficient at CIC/Navigation operations could apply such skills to SAR. Collision Avoidance is certainly appropriate for all vessels and the procedures and techniques used are inherent CIC/ Navigation training scenarios.

In addition to standard provision of established training lessons, the simulator can be used to verify the effectiveness of newly developed lessons and techniques and to reconstruct reported operational problems for development of safety procedures.

A.5 COST BUILDUP FOR 378 SHIP SIMULATOR

The cost benefit analysis requires that the approximate costs for the 13 tasks outlined in Figure A-1 be developed. The following represents this cost development and a brief description of the task effort for the 378 Ship Simulator Training System Tasks. These costs will be based on outside contracting, although much of the efforts could be undertaken by U. S. Coast Guard personnel.

This total effort represents a new operational training plan with all the tasks required to include the incorporation of the 378 ship simulators in this new training system. The following tasks are scheduled in Figure A-1 (Task 1 to Task 11). Task 12 is scheduled in Figure A-2 and A-3 and represents the cost for all the necessary procurements.

Task 1. U. S. Coast Guard Training Effectiveness Evaluation

This effort requires the interaction of several groups within the Coast Guard in order to establish:

- Interaction between academic, functional & operational training
- Performance goals by ships and missions
- Pipeline training by ships, missions, and personnel
- Schedule & mixture of training approaches
- Define optimum method to fill training shortcomings
- Potential of expanding the 378 simulator to include training for the 210 and/or other ships
- Evaluation of the potential for non-training usage of the simulator.

The cost estimate for this is 4 man years resulting in a $200K total cost.

Task 2. Evaluate Training Afloat

This effort requires the redefinition of operational training afloat including modification of the training documents, and the training which will be performed in OJT, REFTRA, and ASWEX. As the training in each of these areas is modified by the increased use of ship simulator training, the training documents to support those changes must be prepared.

The cost estimate for this is $100K for 2 man years of effort.

Task 3. Standardize CG-415

The lesson plan outlines will be altered to fit the new requirements dictated by the ship simulator operation as dictated by the outputs of Task 2. This effort should expand the guidance provided in the lesson plan outlines by providing some of the detail that has been generated by various ships to support their training plan. This would necessitate expansion of these lesson plan outlines by both ship type and ship missions.

The cost estimate for this is $200K representing 3 man years of effort and $50K for the necessary training materials.

Task 4. Develop Simulation Training Scenarios

The outputs of this present study have been generated based on the 505 scenarios developed from the analysis of REFTRA and CG-415. These provided a starting point for the analysis in Tasks 1, 2, and 3. The Task 1, 2, and 3 analysis will modify the original scenarios and this task (4) will bring the ship simulator training analysis into perspective again. with the detailed definition required for procurement and operation.

The completion of this task provides the basic scenario definition for the twenty-one procurements planned to provide the ship simulator training system. twenty-one procurements are outlined in sheets 2 and 3 of Figure A-1.

The cost estimate for this is $1,850,000 based on writing 185 scenarios at $10,000 each. The expansion of these basic scenarios to 505 will be done later by the teaching staff at the 378 ship simulator school.

Task 5. Develop Training Evaluation Plan and Schedule, and Perform COMDAC/378 Tradeoff

The evolution of a new training approach within the U. S. Coast Guard should be undertaken with care and flexibility. The implementation of a dynamic training evaluation system will provide data to direct and redirect the training being provided in the training system.

Training effectiveness can be measured by the use of questionnaires as has been done in this study and in efforts to measure the professional training at the Academy. This is supplemented by reviewing the grades achieved in REFTRA and could include a Coast Guard evaluation system like REFTRA except with the instructor/evaluator going to the ship instead of bringing the ship to the instructor.

The final form of the evaluation system should be such that it can obtain sufficient subjective and objective data to provide reliable feedback. This data should be received, evaluated and used to continuously alter the training system approach in all three areas (Academic, Functional and Operational) to assure that economical and effective training is being provided.

Scheduling to provide the students, instructors, and crew for the 378 during the phased implementation of the ship simulator will be required. We anticipate that the basic approaches to scheduling

can be formulated in this task. The effort will require interface with the necessary groups within the U. S. Coast Guard to handle the interface between school, the Navy, Operations and Personnel.

This task will have to make the final decision on the potential for the modification of the 378 to include the COMDAC system, or to remain with the present complement of electronics and crew. The task effort will be able to use the outputs of Tasks 2 and 3 on Figure A-2 which defines the COMDAC training scenarios and device functions. The effort on the 378 simulator development and the 270 simulator development shown in Figure A-2 run approximately parallel to this point. The follow-on plan assumes that the 378 will remain in its present configuration.

The cost estimate for this task is $200,000 based on four man years of effort.

Task 6. Evaluate Non-Training Usage of Simulator

Task 6 is performed in parallel with Task 5 since if there is to be any non-training usage of the simulator it will have to be determined in time to fit within the schedule. The U. S. Coast Guard R & D Groups and Merchant Marine Safety Groups could utilize the ship simulator to aid their efforts.

The cost estimate for this effort is $100,000 based on two man years of effort.

Task 7. Integrate/Interface Training Systems

This task runs in parallel with the Task 5 efforts and requires the definition of the planned activities out to mid-1985 as the ship simulator subsystems become operational.

The cost estimate for this task is $100,000 based on two man years of effort.

Task 8. Training Evaluation Plan and Feedback System

Task 8 is performed in parallel with Task 5 and provides the necessary material and procedures for the training evaluation system. This feedback system will provide the means to keep the training system current.

The cost estimate for this effort is $100,000 based on two man years of effort.

Task 9. Simulator Training Facility Specification

The building, classrooms and other facilities necessary for the 378 ship simulator facility will be specified for procurement. These specifications will be peculiar to the final site selection for the facility.

The cost estimate for this effort is $100,000 based on two man years of effort.

Task 10. Facility Operation and Maintenance Plan

The facility operation and maintenance plan will detail the phased build up of these operations. The operations build up to match the increased simulator hardware at the facility. The implementation and integration of the simulators begins in mid-1981 and ends in early 1985.

The cost estimate for this effort is $100,000 based on two man years of effort.

Task 11. Procure Facility

The contract for the necessary facilities will be let in the third quarter of 1979 with final availability to match the delivery of the first simulators (see second sheet) - CIC (Surface) and CIC Air.

The cost estimate for this effort is $2,500,000 for the necessary construction.

Task 12. Procure Simulator Training Subsystem

There are 21 procurements to acquire the full 378 ship simulator. These are outlined in Figures A-2 and A-3. The incremental acquisition costs total $6,379,600 for the 21 procurements. The cost of specifications for these procurements is estimated to be $50K (one man year) each to develop, thus totalling $1,050,000 for the 21 specifications.

A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY BE EFFECTIVELY APPLIED TO THE ACCOMPLISHMENT OF COAST GUARD VESSEL OPERATIONAL TRAINING

CONTRACT DOT-CG-61814A

APPENDIX B

CATALOG OF SIMULATOR HARDWARE AND TECHNIQUES

PREPARED FOR

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APPENDIX B
Catalog of Simulator Hardware and Techniques

INTRODUCTION

During the course of the study described in the main body of this report, ADC has contacted over 80 potential suppliers of simulator systems and subsystems believed to be of possible use in the establishment of simulator-based training facilities for the U. S. Coast Guard. Of these suppliers we have, through correspondence, via telephone, or in direct personal contacts, obtained meaningful information from 42. This information falls into three general categories: that concerning systems designed for maritime training, that concerning systems designed for other kinds of training (aviation, land warfare, etc.) and that concerning subsystems or components which may be of use in the development of a broad range of simulator training systems.

In those cases where existing systems or subsystems appeared to be applicable to the kinds of training of interest to the Coast Guard, an attempt was made to obtain specific cost information.
In most cases suppliers were unable to provide such information for several reasons, including:

(1) The system in question was developed to the requirements of a specific client and cost information is considered proprietary.

(2) Costs included a high proportion of R&D, some of which would not apply to additional units, so cost information would be misleading.

(3) As a matter of company policy, prices are given only during negotiation for a system to be provided to meet a definitive specification. Prices vary greatly dependent on detailed specs.

For the cost benefit analyses presented in earlier sections of this report, we were able either to get approximate costs from potential suppliers based on our detailed system descriptions or were able to deduce such costs based on lengthy discussions with the suppliers. So few of the suppliers were able to provide cost information for publication that no such information is included in this appendix.

This catalog is intended to present a broad, rather than a tremendously detailed picture of the kinds of training simulator systems which have been designed in recent years. We have queried as many potential suppliers as we were able in the time allotted for our study. It is probable that some have been overlooked, in which case we apologize for the omissions. It is also probable that in some cases we have, because of our misunderstanding of the literature received, presented incorrect descriptions of a supplier's products. We believe that the number of such cases is small, but caution the reader to contact the supplier of any system in which he is interested for more detailed information prior to passing judgment on the performance of that system. Finally, it should be noted that the space devoted to each product in this catalog is by no means intended as a measure of our opinion of that product's usefulness. Each user must make his own judgment based on his specific needs.

COMPANIES SUPPLYING MARITIME SIMULATOR SYSTEMS

1. AAI Corporation
2. Decca Radar, Ltd.
3. Hughes Aircraft Company
4. IHI, Ltd.
5. Le Materiel Telephonique
6. Netherlands Ship Model Basin
7. Redifon Electronic Systems, Ltd.
8. Rockwell
9. Singer
10. Sperry Rand
11. TNO
12. VFW-Fokker

AAI Corporation - of Baltimore, Maryland, developed the Device15F12 Radar Navigation Trainer, which is a digital landmass and target simulator for surface search radar sets. It is used to train CIC teams and bridge personnel in the technique of shipboard radar navigation and collision avoidance.

Ownship simulated radar is adjustable over a very broad range of antenna, receiver and transmitter characteristics. These characteristics are pre-programmable and can be varied by the device operator to simulate almost any U. S. Navy surface search or 2D airsearch radar.

The radar video simulation includes sea return as well as return from targets, land, cultural features, and navigational aids. The digital data base includes bathymetry for depth indicator simulation.

One of the key characteristics of Device 15F12 is its ability to operate directly from a digitized topographical map. Any port or harbor area for which digitized charts exist can be simulated by this device. Device 15F12 has the capability of 480,000 vectors and 16,000 distinct (point) features.

The AAI-designed equipment converts the landmass data into radar video and also drives the depth indicator and the dead reckoning tracer. The device operator uses a CRT terminal to control the training exercise and to maneuver ownship in response to the trainee's orders or recommendations.

The ASW Attack Teacher, Device 21A38, built by AAI Corporation is a submarine anti-submarine warfare trainer. A single attack trainer can be operated using from 1 to 12 targets. Two attack trainers can be used independently but simultaneously, dividing the twelve targets. Two attack trainers can be used in coordinated problems with the 12 targets available to both. Two attack trainers can be operated against one another. All 12 targets can represent either submarines or surface vessels; one of 12 may be an aircraft. The training exercises can be recorded and played back at real time, two times real time or four times real time.

Each attack trainer contains a simulated submarine attack center and sonar room, a program operator station, and a classroom.

Device 20A61, the Maneuvering Tactics Trainer (MTT), designed by AAI is capable of training up to 20 personnel at a time. Training and performance evaluation can be carried out at many experience levels. These levels range from officer candidates, who are relatively inexperienced in ship handling procedures, command technology, and the concepts involved in tactical maneuvers, to senior fleet officers, who want to increase their familiarity with maneuvers involving more than one ship, such as ASW search plans, replenishment at sea, nuclear defense screen, etc. The primary purpose of the trainer is to train and evaluate personnel acting as a team in the accomplishment of ship maneuvering problems.

Exact replicas of actual operational equipment have not been provided. The emphasis in this system has been directed at highly accurate simulation of the vehicle hydrodynamics found in the vessel types represented by the MTT. This simulation includes such detailed factors as ship handling response time as well as raw vehicle hydrodynamics to achieve the purpose of the MTT.

Device 20A61 complement:

24 bridge mock-ups
12 simulated vehicles
8 CIC mock-ups
3 officers in tactical command rooms (instructor's station)
1 equipment room

The 24 bridge mock-ups and 12 simulated vehicles can be assigned the characteristics of any one of nine types of vehicles, six of these vehicle types are operational Navy ships, two are simulated aircraft, and one is a fixed target or buoy.

Each of the 24 bridge mock-ups is configured to approximate the bridge of an actual ship containing a simulated helm unit, a simulated radar display, an electronic situation display, a problem clock and a set of communications equipment. Also included are a maneuvering board, status board, and a communications table.

The simulated helm unit contains a Rudder Angle Control and a Right and Left Engine-Order Telegraph. Also provided on the helm unit are a gyrocompass and pitometer log indicator which provide course and speed information for the vehicle being simulated.

The Radar display unit is a composite simulation of typical display units, providing all those controls usually found on such devices. Only those vehicles participating in the same problem exercise are presented on a display. The normal radar display is ownship-centered and North oriented.

The electronic situation display is provided to allow trainees to observe the motion of their vehicle with respect to any other vehicle in the problem. The problem area, selected by the instructor at his console, can be any square area from eight to 1024 miles on a side. This display appears on a 17-inch square area in which the selected problem ocean size always fills the screen. Each vehicle on the display carries an alphanumeric identification which describes it as a physical bridge unit or as an artificial target. The shape of the vehicle image identifies the vehicle as to type.

The problem clock of a bridge mock-up is controlled by a master clock at the instructor's console. The instructor can selct any one of four problem time rates; real time and two-times, four-times, or eight-times real time.

The eight CIC mock-ups each contain equipment similar to that found in each bridge mock-up. This includes a simulated radar display, a problem clock, and communications equipment. Also contained in the CIC room is a dead reckoning tracer or a NC-2 plotter typical of the type found in shipboard installations.

The device is capable of operating in four independent problem modes simultaneously: three under the control of the three instructor-controlled consoles in conjunction with the associated bridge and CIC mock-up (manual problem) and one under the control of a pre-punched paper tape (automatic problem). The instructor can select any of the 36 vehicles (24 bridge mock-ups and 12 instructor-controlled vehicles) in any combination to be used in any of the four problems.

The degree of difficulty of a training exercise is controlled by the instructor. Complications can be added during a training exercise by the insertion of malfunction commands.

All computation of vehicle motion is performed by a general purpose digital computer, with I/O data processed through special purpose interface equipment.

The Mobile Combat Systems Trainer (MCST) developed by AAI Corporation can present data to five shipboard radars simultaneously. Six independent targets, including boats, aircraft and missiles, are generated and mixed with land and sea clutter, ECM and chaff. The five radar types, which include a short range air search, a long range air search, a three-dimensional air search, and two missile or gunfire control radars can be selected from a total of twelve radar type. Presentations are coordinated between the radars.

Decca Radar Limited of Surrey, England, has developed a ship simulator with a correlated night time visual system. The entire simulator is housed in two "Portakabins" each 36 feet in length by 12 feet 6 inches in width and 8 feet 6 inches in height. One portakabin contains the bridge window and the bridge along with the electronics--computer, interfaces and control equipment. There is also a captain's day cabin and a monitor room containing the instructor's console. The other portakabins contains the rear projection screen and the projectors.

The bridge equipment is a standard complement as found on a commercial vessel. A maximum of eight buoys and two "other ships" can be seen in a given scenario. By sacrificing the two "other ships" a total of 16 buoys can be inserted into a scenario. The scenario can be readily changed by inserting a new magnetic tape cassette. Ship handling characteristics and visual perspective of navigation lights are computed as well as engine noise and vibration.

The Training Systems Engineering Facility of Hughes Aircraft Company - of Culver City, California, designed and constructed the F-14 Mission Trainer (Device 15C8A). Device 15C8A is a digital computer-based simulator specifically designed to provide training for an F-14 Naval Flight Officer (NFO). The trainer has a capacity for 96 tracks which represent a selectable mixture of sensor-detectable air targets, ECM carriers, data link targets, ground targets, and artificial symbology. The gaming area is 1,000 nautical miles on a side and from zero to 100,000 feet in elevation.

Hughes has also built an F-111B Missile Control Officer Trainer (Device 15C8). The major features of the trainer are listed below:

- Realistic simulation of AWG-9 controls and displays; limited simulation of pilot flight control and display equipment.
- Use of a general-purpose digital computer for generation of target and ECM data; realistic simulation of AWG-9 computer operation for both high and low PRF air-to-air modes; and control, programming and switching of trainer functions.
- Digital techniques in display data processing and complex sensor simulation of antenna and IF scan patterns.
- Provisions of extensive problem formulation aids to assist creation of program exercises.
- Provisions for instructor intervention in the tactics to simulate actions of the competitive intelligent adversary and for instructor insertion of simulated failures to selected elements of the system.
- Repeaters which allow the instructor and observers to view the effects of student actions and whch permit viewing of the trainer displays and monitoring of the total tactical sitaion.
- Simulation of up to 96 dynamic targets, freely maneuverable in a 1000-by-1000 mile gaming area.
- Control and programming to allow for simulation of the effects of a wide range of ECM.
- Provision for stopping, resuming, recording and replaying the exercise to assist in the critique of student performance.
- Capability for expansion to include operation with a landmass simulator.

The Mobile Integrated System Trainer, Evaluator and Recorder (MISTER) system in development by Hughes Aircraft Company is a trailable dockside simulation van. MISTER has the capability of stimulating radar, sonar and navigation equipment of any U. S. Navy ship when connected to each equipment.

This concept can be used by the Coast Guard for the same purpose, and it lends itself to COMDAC in particular. By utilizing this form of simulator each team member will be using this actual equipment in his own environment. If required, several vessels may participate in the same problem, thus enabling fleet exercises to be performed without consuming fuel. This device offers good training to CIC and ASW teams. It is of lesser value to bridge personnel associated with ship handling.

IHI (Ishikawajima-Harima Heavy Industries, Ltd. - of Tokyo have developed three kinds of simulator systems. They are:

Maneuvering Simulator - This is a large scale system in which the ship's bridge is a detailed emulation of the bridge of a typical modern merchant vessel with all the standard equipment. The visual scenes observed through the bridge windows are projections of filmed scenes in color on a semi-circular screen at a radius of 8 meters from the viewing point. Five projectors are used: One provides the background scene (seascape, horizon, island terrain profiles); a second projects the foredeck of own ship (a variety of vessel types are available); a motion picture projector provides own ship's bow wave; a "target ship projector" provides up to five other ships in the scene; an "object projector" provides up to five buoys, lighthouses, etc. The visual scene subtends 160° in azimuth and 30° in elevation. The entire own ship structure can be hydraulically driven to simulate ship motion. Own ship speed can vary from 10 knots astern to 40 knots ahead, target ships from 0 to 40 knots ahead. Using zoom lens techniques, target ships may appear from 0.3 mm to 8.0 mm distant. Own ship's response to engine orders and helm orders can be made to simulate the characteristics of a large range of vessel types.

Engine Plant Simulator - This system emulates the control and monitoring panels of a modern marine turbine installation. It is designed to train engine room personnel in turbine plant startup and shutdown procedures and emergency procedures.

Tanker Cargo Handling Simulator - This system emulates the cargo handling system of a VLCC and can be used to simulate all of the normal and emergency procedures encountered in such systems.

Le Materiel Telephonique, Division Simulateurs et Systems Electroniques - Paris, France. This company has designed a large scale ship handling simulator. Its primary features are:

- a ship's bridge (a variety of bridge layouts can be provided
- a computer controlled scene generator which provides a moving scene in correct perspective from video scanned models or CGI
- a panoramic projection system providing the seascape surrounding the vessel
- a bridge motion system (optional)

Vessels ranging from 500 tons to 300,000 tons can be simulated and characteristics of various propulsion types can be provided. The dynamic effects of conventional or special (bow rudder) steering controls, deep or shallow water, channels, sea bottom, tidal streams and waves are all simulated. The field of view can range from 120° to 360° in azimuth.

Up to five other ships, appearing at any point in the visual scene, can be shown. As range and relative bearing changes, the other ships mask the background scene. The foredeck of own ship is shown in proper relation to the height of the bridge. The bridge contains all instruments, indicators and controls and all navigation equipment found on a modern vessel.

LMT has also designed a broad range of simulators for pilot training in military aircraft handling and tactical mission performance as well as simulators for both military and commercial transport aircraft and helicopters. They have used both CGI and video scanned model-board techniques in the design of battle-tank and gunnery simulators.

The Netherlands Ship Model Basin (NSMB) - operates a simulator which was designed and constructed by the Institute of Mechanical Constructions T.N.O. - IWECO at Delft. The specifications were generated by the NSMB. The design was based on the principle of a point-light-source projection system initiated by the Institute for Perception R.V.O.-T.N.O.-F.2.F. at Soesterberg. The light source is a "Xenon Compact Arc" lamp.

The simulation of the sky, horizon, sea, coastline, other ships, buoys, harbors, etc., is accomplished by projections of some objects around a point-light source. For sky, horizon and sea colored cylinders are used. For coastline, a harbor configuration or another ship passing by are obtained from the shadows of three-dimensional detailed models.

The projection system is placed on top of the wheelhouse around which a cylindrical projection screen with a diameter of 67 feet is placed. The wheelhouse is equipped with standard commerial bridge equipment necessary to run the ship.

The projection system is controlled by a hybrid digital/analog computer receiving inputs from the rudder control and engine setting. Wind, current and waves are also factors calculated into the movement of the own ship.

Most of the environmental conditions are stored in the digital portion of the computer while the analog portion is mainly used for the programming of the ship's maneuvering characteristics.

Redifon Electronic Systems Limited - of England is a major producer of maritime trainers and simulators. They have worked with American Airlines in producing Novoview, Duoview and Monoview model board and optical probe visual systems.

Redifon is a major producer of navigation equipment such as Loran C and Omega navigator and Satellite Navigator Type RSW1 as well as radar navigation equipment and radio communications equipment.

The following is a brief description of navigation and fleet trainers manufactued by Redifon.

The Action Speed Tactical Teacher/Weapon Trainer, type C8020, is an advanced and fully integrated simulator complex, allowing the simulation of ships, submarines, hover craft, helicopters, fixed-wing aircraft, missiles and other weapons and the associated radar and sonar detecting sensors. The system provides training in tactics, craft maneuvering, radar and sonar plotting, aircraft and helicopter direction procedures, communications and electronic warfare procedures, either individually or for full command team training.

The modular system comprises eight cubicles (expandable to 24) dynamically representing ships, aircraft, hover craft or submarines. The system also contains communications, a weapons simulator and 48 pre-programmable targets along wih radar and sonar simulation. An auditorium facility containing a large screen display system is available for debriefing.

The Redifon Fleetwork Maneuvering and Communications Trainer, Type C.8026, is designed to provide training for all personnel involved in the maneuvering of ships, as individual units, or as a coordinated group, controlled by voice or light communications.

The trainer has eight training cubicles, each containing one 3-box console allowing for control and monitoring of the ownship movement and communication facilities. A CRT monitor shows the position of each craft and coastline, when required. Each console can accommodate up to three trainees.

The Redifon Marine Radar and Navigation Trainer, Type C.8012 provides training in radar interpretation and plotting, relative and true motion radar navigation, blind pilotage training, collision avoidance, maneuvering and navigation in confined waterways and an appreciation of the ship's characteristics related to changes in helm and speed for the various types of ships. One to four ownships and six target craft are provided. Simulation of effects such as background noise, sea clutter and funnel blanking give maximum realism on the radar display.

Rockwell International, Marine Systems Division - Anaheim, California. Rockwell has built a Submarine Simulation Facility which includes a full scale dynamic mockup of a submarine control station implemented with the controls and displays that are used in the actual submarine. A motion base imparts realistic motion to the control station in response to trainee's control inputs. A computer drives the simulator in any of a large library of naval mission scenarios.

The Simulator Products Division of Singer - located in Sunnyvale, California, has developed three types of visual generating systems.

The Full/Scan Digital Image Generator (DIG) -- furnishes computer calculated imagery faithfully representing the view from any aircraft or from any other vehicle - from submarine to satellite. A maximum of 8,000 lights or displaay edges in any combination are potentially visible per frame at a frequency of 30 Hz, and up to 256 edge intersections per scan line are possible. There is a maximum number of 256 objects in line-of-sight independent of the direction of approach. Calculated occultation effects provide fundamental depth cues to the observer. The video frame rate is either 23/30 or 50/60 per second. At 60 frames per second, edge processing capability is halved. The transport delay is two update periods plus 3 milliseconds between receipt of position and attitude from the simulator to the last scan line of the frame. There are four independent viewpoint channels. Processing capability may be spread across multiple displays without restriction.

This system can be used with any color or black and white television display, including both direct view and projection configurations. There are 1,023 scan lines per frame with 1,024 picture elements per scan line. Up to 64 distinct colors are available to produce 262,000 possible hues with up to 256 intensities applied to each color.

Fields-of-view are possible to suit virtually any requirement. With a single infinity focus WAC window, the field-of-view is approximately 48 degrees horizontal and 30 degrees vertical.

A real-time shading algorithm creates the appearance of curvature and depth for otherwise flat surfaces. The effects of natural and artificial illumination sources are realistically produced. The effects of haze and clouds can be introduced into the real-time scene. Horizontal and vertical edge smoothing as well as anti-scintillation measures are provided. Dynamic movement of ground, water and air objects, such as cars, ships, aircraft and missiles can be provided. This system is adaptable to both existing and new simulator designs.

The Point/Scan Night Visual System (NVS) -- provides computer generated night scenes in full colcr. This system employs more than 6,000 light points and produces horizon glow and runway surface markings. A beam penetration tube is used, thus providing seven colors between red and green, white (displayed as yellow-white), orange, amber, gold, red, chartreuse and green. The picture update speed is 30 Hz which affords flicker-free video. This system can be integrated with virtually any flight simulator and is being widely used by commercial airlines.

The High Resolution/Camera Model Visual Display System--produces highly realistic scenes regardless of altitude. This is accomplished by using a high-detail terrain model scanned by a high resolution color camera coupled to a wide angle, servo-driven Scheimpflug-corrected optical probe specifically developed for this system. A scale factor of 1,500:1 is used. The video system uses three SEC vidicons to provide relatively low resolution color information and a two-inch intensified vidicon to provide high resolution luminance information.

The Simulation Divsion of Singer has devloped a Collision Avoidance Radar Simulator (CARS) now in use at the Maritime Institute of Technology and Graduate Studies (MITAGS), Linthicum Heights, Maryland. This system is composed of eight trainee cubicles and two instructor consoles and associated computer hardware. Each cubicle contains basic bridge equipment, two 16-inch PPI's (true and relative motion), and two plotting tables.

Each cubicle is tagged "ownship" and is independently maneuverable by the student. The instructors have control of eight target ships plus eight buoys. These buoys can be repositioned by the instructor anywhere within the seven programmed harbors. There is also an unlimited open sea gaming area.

Communications consists of ship-to-ship and ship-to-shore VHF communications. The students communicate with each other as well as with the instructors controlling the eight target ships. The instructor stations include two 12-inch relative motion PPI's and instructor's control consoles.

Singer has designed and built Naval Tactics Procedure trainers for Germany and Denmarkk. The Danish System consists of 12 ownship CIC rooms containing a PPI, an active plotting table, communications equipment, a ship control panel, a weapons control panel and radar and IFF control panels. The simulation consists of 100 targets made up of aircraft, surface craft and subsurface craft. Target and ownship position computations and radar range resolution of coastline video are accurate within fifty yards.

The system supplied to Germany consists of six ownship trainee cubicles, each containing a radar control desk, RADAR/IFF control panel, ship control panel, intra and inter vessel communications. The six ownships can be designated as eight different types of vessels including underwater, surface and airborne maneuverable in a 200 x 200 nautical mile gaming area.

This trainer contains relative motion and true motion PPI's and a plotting table drive system for each ownship. Intra and inter vessel communications is also a complement of this training simulator. Each ownship cubicle can maneuver vertically, thus operating as a submarine or aircraft. In both cases an auditorium is available for observers and mission debriefing sessions.

Singer has also developed several helicopter trainers for the military services.

Sperry Rand - at Lake Success, New York, in conjunction with Evans and Sutherland has developed a CGI system for the National Maritime Research Center at Kings Point, New York. It is the visual system associated with the bridge handling simulator for computer-Aided Operations Research Facility (CAORF) for which Sperry was the prime contractor.

This CGI system is capable of generating 256 edges with 512 intersections for viewing at any given time. The video data is transferred to five Eidophor projectors that deliver color images to a semi-circular screen at approximately 30 feet distance. This system offers a 240-degree horizontal F.O.V. and a 24-degree vertical F.O.V. Fog/fading, edge smoothing, aerial and terrestrial perspective are standard enhancements of this system.

Sperry Rand has also developed a model board and optical probe visual system for Marine Safety Institute. This system offers a 140-degree F.O.V. horizontally and a 24-degree F.O.V. vertically. Ownship can travel within a geographic area constrained to 50 (5 x 10) square nautical miles for any selected training scenario. This type of system requires only one person to operate the simulator, namely, the instructor.

The images seen by the optical probe are transferred to three projectors which transfer the data to a semi-circular screen. This system offers a high degree of visual realism but is restricted in its gaming area.

TNO - INSTITUTE FOR MECHANICAL CONSTRUCTIONS - of Delft, The Netherlands designed and built the large-scale ship handling simulator now in use at the Netherlands Ship Model Basin. This system includes a projection system and screen to provide the visual scene outside the wheelhouse windows, a complete wheelhouse with all instruments normally installed in a modern vessel and a computer system programmed with the motion equations of the vessel being simulated. The bridge is designed to accommodate a full bridge team - master, navigator and helmsman.

A later version of this simulator has recently been completed. A new rear projection system using a translucent screen provides visual scenes of much greater fidelity and higher resolution than does the system designed earlier.

VFW-Fokker - of Bremen, West Germany, is a major producer of aeronautical and naval simulators. They have produced a number of aircraft simulators, some with correlated visual scenes. The visual scenes are composed of a TV camera pickup from a graphic display console projected onto a large screen by an Eidophor projector. They are currently working with a model board and optical probe design for ship handling simulators. They also produce and design other simulators concerning navigation and maneuvering, cargo handling, engine room operation, and fish trawler operations.

COMPANIES SUPPLYING OTHER TYPES (AVIATION, LAND-BASED, ETC.) OF TRAINING SYSTEMS:

1. American Airlines
2. Applied Devices Corporation
3. Atkins & Merrill
4. Burtek
5. Educational Computer Corporation
6. G. E.
7. Goodyear
8. Grumman
9. Reflectone, Inc.
10. Vought

American Airlines - in partnership with Evans and Sutherland and Redifon has produced a number of flight simulators for the commercial airlines worldwide as well as the United States military. A combination of Evans and Sutherland's computer graphic expertise and Redifon's visual systems and raster scan experience has produced day/night CGI flight simulators. Model board and video probe devices have also been produced.

The Redifon Novo View 6000 with Runway Surface and Markings utilizing CGI equipment developed and manufactured by Evans and Sutherland has the capability of controlling 6000 light points on a color display unit. This system provides runway surface and markings, including diagonal edges, for a maximum of six runways.

The Redifon Duo View display provides the visual scene in realistic perspective to all crew members. This device utilizes the three-dimensional model board and optical probe approach.

The Redifon Mono View display provides a model board display for a single trainee in the same fashion as the Duo View.

Applied Devices Corporation - of Hauppauge, Long Island, New York, has developed and manufactured several simulators and trainers for the military. The following is a brief description of each unit.

- Radar Simulation Device 21-B-32 - a simulation system with one maneuverable simulated air target and simulated programmed target, either or both of which may be viewed on radar displays. Intended as a shipboard training device.
- Simulator Devices X19A1 - radar simulators for training missile ship's crew in tracking, designating, and launching procedures for targets acquired by surface search, air search, and fire control radars, as well as submarine targets.
- Airborne Radar Signal Simulator, Device 15A11 compact airborne radar signal simulation system capable of simultaneously synthesizing a large number of independently controllable radar returns and displaying them, when required, with actual target indications.
- Device 3G36 - simulation device for training HAWK Weapon System crews. It provides synthetically produced displays for introduction into the Weapons System radar. The simulator supplies a total of six individual independently maneuverable targets and IFF responses are provided for each target so that they can be challenged and identified.
- Radar Simulation Device RS12 and RS14 - a radar target and ship motion simulator providing up to eighteen air and eleven surface targets to operational equipment of six ship mockups for fleet air defense training of CIC weapons control and fire control radar personnel.
- Radar Simulation Device 3-D-32 - A six-air-target radar simulator for purposes of training and evaluating Navy personnel in the operation of complete target designation and gun fire control systems at shore-based installations.
- Radar Simulation Device 21-B-33 - a modernized version of Device 3-D-32 which includes the expansion capabilities of up to 18 air targets, with gun fire control, air search and target designation systems.
- Radar Simulation Device 21-b-23A - contains six independently maneuverable targets, any or all of which may be viewed on radar displays. The system is designed for use as a shipboard training device.

The Atkins and Merrill Training Equipment Division - of Tulsa, Oklahoma, produces and designs individual systems trainers, Study Carrels, Quick Quiz and Student Response Systems. The Automat Rapid Tutor is an audio/visual self-teaching machine comprised of a tape recorder, motion picture projector and slide projector arranged in a student carrel.

They have developed large, back-lighted classroom system trainers for various systems aboard aircraft such as hydraulic and electrical systems. Among their larger trainers is an Advanced Cockpit Procedures trainer incorporating automatic flight control and automatic flight guidance systems. Their simulated instruments have been used by Boeing, Singer, McDonnell-douglas and Lockheed as well as numerous airlines.

In addition, they have designed and constructed flight simulators of the fixed and motion base types for many airlines, domestic and foreign.

The Burtek Adaptive Learning System - is an arrangement of equipment, components, apparatus, and materials providing the simulation of those portions of actual equipment that the student will be required to analyze and maintain.

The Universal Master Console contains all the required systems controls in addition to a field programmable slide projector system, all the necessary interface logic, and the student evaluation indicators. It may be used with a number of different System Training Panels.

The System Training Panel depicts a system either schematically or isometrically. It contains the necessary switches to simulate checking, troubleshooting, or overall evaluation of the system operating condition.

The ECII trainer developed by - Educational Computer Corporation - consists of a console housing a digital computer, a high-speed random access projector, and the system control center. When a pre-programmed instructional unit, called the simulation model, is installed on the console it becomes a specific systems trainer.

ECC manufactures two main frame console configurations: ECII and ECII-LP. The ECII is a desk sized unit for individual, self-paced training. ECII-LP has an enlarged simulation model display designed for classroom demonstration and student group use.

The typical ECII simulation model consists of a unique simulation display panel, a simulation model data cassette and a visual projection disc. The display panel is the focal point during ECII instruction and takes the form of a three-dimensional dynamic display of an equipment system or technological concept. All simulation display panels are uniform in size and interchangeable among ECII consoles. The projection disc contains visual projections of technical data displayed in conjunction with dynamic simulation panel operation. Data cassettes contain pre-programmed digital information used by ECII computer to "operate" the simulation model. Together, these three elements comprise the simulation model installed on the console.

The EC3 trainer developed by Educational Computer Corporation is an upgraded version of the ECII. It consists of a desk-type console housing a 16K micro-processor memory, an IBM compatible diskette, a random access visual display (150 pictures) and a system control center. This unit offers optional features such as add-on memory to 64K in increments of 16K, interactive visual displays and keyboard, and hard copy printout.

The General Electric Company - Space Division, Daytona Beach, Florida, has developed a CGI image generator monochrome system for use with the ASUPT trainer used by the USAF. This is a seven-channel, inline, on axis optical display developing 280 degrees horizontal and 140 degrees vertical F.O.V. utilizing seven large (36") cathode ray tubes in a mosaic pattern.

The ASUPT CGI system has a display capacity of 2,500 edges incluing 500 edges to provide for system over-capacity correction and left-hand boundary edge generation. At any instant of time, 256 display objects of two-dimensional or three-dimensional type can be within the field-of-view. Environment data storage capability is 600,000 edges.

General Electric has also developed a color CGI system capable of driving up to five channels (CRT's). This system has a display capacity of 1,000 potentially visible edges with 2,000 variable point light sources. An option is available to increase the edge capacity to 2,000 edges and 4,000 point light sources. There can be 256 objects per scene or optionally 512 objects per scene.

The field of view per channel is 30 degrees vertical by 40 degrees horizontal for a total of 150 degrees vertical by 40 degrees horizontal, maximum.

Digital edge smoothing, variable fog/fading, aerial perspective and broken clouds are standard enhancements with curved surface shaping optional.

The Goodyear Aerospace Corporation - of Akron, Ohio, has developed a number of simulators for the U. S. Navy and U. S. Air Force and has participated in many study programs and research and development projects involving training devices for marine systems, as well as aircraft. Listed below is a description of simulators and trainers they have developed and produced.

- Device 2H87--Aircraft Carrier Landing Trainer--This flight trainer with a virtual-image display of +20, -40 degree vertical and 120 degree horizontal field of view trains pilots in landing aircraft on Forrestal-class carriers. The visual system provides continuous visual simulation from six miles to touchdown. This system utilizes the model board/TV optical probe approach to image generation, at a 250:1 ratio. The model board carrier model, mounted on a motion base, gives realistic pitch, roll and yaw motions.

- Device 2F90--TA-4J Aircraft Operational Flight Trainer--This flight trainer consists of four identical-but-independently operated-cockpits and instructor stations. One general-purpose digital processor services all four trainers. Four students can fly in formation or on separate missions simultaneously. The cockpit is a replica of the forward cockpit of the TA-4J aircraft. Aircraft simulation includes motion: pitch, ±15 degrees; roll ±15 degrees; and vertical translation ±6 inches. Aircraft sounds, aerodynamic functions, environmental effects and effects of external stores are also simulated.

- Device 2F65--E2A Weapon System Trainer--Ths trailerable system simulates all avionics systems, all aircraft systems and the aerodynamic and engine performance of the E-2A Hawkeye aircraft. The complete training system is housed in three trailers, each 40 feet long, 8 feet wide and 12-1/2 feet high. There is no visual scene, but an artificial lighting system surrounds the cockpit to provide varying ambient light conditions. The simulator also contains a CIC compartment and a tactics console. The aerodynamics, engine and aircraft flight systems are controlled by a special purpose analog computer and the tactics computer, a special purpose digital device controls the target generation, radar simulation and data link required for a tactics training problem.

- Device 2F67--A-6A Weapon System Trainer--This trainer simulates all avionics systems, all aircraft systems, and the aerodynamics, engines and armament system of the A6A Intruder aircraft. The cockpit is mounted on a six DOF motion base and is controlled by a special purpose analog computer. The landmass simulator utilizes the slide tranparency approach and portrays ground area at a transparency scale factor of 1 to 5,000,000. Six moving targets and ground based jamming can be presented on the radar displays.

Other simulators developed and produced by Goodyear are:

Device 15C4E Radar Tactics Trainer (airborne)
Device 15G10 Carrier Air Traffic Control
Device 15G13 Carrier Control Approach Simulator
Device 15F5 Tactics Trainer
F-15 Simulator Trainer (USAF)
Formation Flight Trainer (USAF)

The Grumman Aerospace Corporation - of Bethpage, New York, designs and manufactures aircraft simulators for aircrew training as well as maintenance training. The F-14 Operational Flight Trainer (OFT) with a four-degree-of-freedom motion base contains an exact replica of the F-14 Tomcat cockpit. The F-14 Mission Trainer (Device 15C9A) used in conjunction with the OFT provides training for the Naval Flight Officer (NFO). This combination of trainers allows either independent operation (one crew member) or mission training (both crew members). Grumman's series of 15 Naval Air Maintenance Trainers (NAMT's) provide training in flight controls, fuel systems, the hydraulic system, etc.

Grumman also produces E-2C trainers for air crew training such as the Cockpit Procedures Trainer (CPT) and an Integrated Systems Maintenance Trainer (ISMT). They also produce a Tactics Trainer that simulates a wide variety of E-2C aircraft missions.

Grumman's A-6E Weapon System Trainer (WST) provides pilot and bombardier/navigator transition training, integrated crew training, and maintenance of flight and weapon system proficiency in the A-6E Intruder.

This simulator is mounted on a six-degree-of-freedom motion base enabling the trainee to perform many procedures such as pre-flight, take-off, emergency procedures, etc. This trainer is used in one of three modes: flight only, tactics only, or mission mode.

Grumman's Naval Electronic Warfare Training System (NEWTS) provides students with generic system training for surface, subsurface, and airborne Electronic Warfare (EW) systems. It is a programmable capable of being upgraded for future equipment. This system is capable of training up to 70 students simultaneously in a computer assisted instruction (CAI) mode. Each instructor monitors up to ten students and assists only when needed.

Grumman's Suitcase Emergency Procedures Trainer (SCEPTR) is a portable training device to provide effective training in correct cockpit emergency procedures. It is a half-scale replica for a given aircraft type containing procedure -related switches, controls, annunciators, and response lights plus a set of pre-programmed cases, one for each procedure in the pilot's pocket checklist.

Reflectone Incorporated - of Stamford, Connecticut, is a major designer and manufacturer of computer controlled training devices. Areas of specialization include electronic and mechanical system design, hydraulic system design, design and manufacture of display systems, design and manufacture of instructor consoles, mathematical modeling, programming, computer systems, environmental simulation, design and manufacture of motion systems, and interfacing with visual simulation systems.

- SH-2F, LAMPS, Weapon System Trainer (Device 2F106)

  Helicopter trainer complex for pilot, copilot, and sensor operator. Includes full cockpit simulation, sensor operator station, motion and visual system. The visual system is a CGI system developed by McDonnell-Douglas known as VITAL III. It provides simultaneous presentation at all four windows. The scenes include airport, heliport, aircraft carrier and destroyer visuals. The six-degrees-of freedom motion system simulates flight characteristics, ground handling, buffeting and vibration.

- CH-46E Operational Flight Trainer (Device 2F117) -- Trainer complex with full flight simulation and motion. Provisions for visual system. Developed for NTEC.

- Operational Navigation Classroom Trainer (Device 1A22) -- Trains 16 or more students simultaneously in military and civil air-navigation techniques. Includes dead reckoning navigation, celestial navigation, electronics and radio aids techniques, and other navigation techniques.

- Airborne Mine Countermeasures Part-Task Trainer -- Portable classroom trainer. Teaches operation and characteristics of mine countermeasures equipment. Includes simulated (1:1 scale) model for student use and 4:1 scale model for classroom use. Developed for NTEC.

- A-4M Weapon System Trainer and A-7E Operational Flight Trainer (Device 2F62A and Device 2F84B) -Fixed wing trainers. A-4M is mobile (housed in a trailer). The A-7E is a fixed base installation with motion system. Trainers are revisions and updates of previously built systems.

- E-2C Aircraft Operational Flight Trainer (Device 2F110) -- Trainer complex simulates E-2C fixed wing aircraft used for reconnaissance and early warning. Developed for Grumman Aerospace Corporation. Fully simulated cockpit simulator includes Reflectone motion system and provisions for visual system.

- HH-3F and HH-52 Operational Flight Trainers -- Two helicopter trainers, including motion; both trainers are simultaneously controlled by one computer. Developed for U. S. Coast Guard.

- HH-53C and CH-3E Operational Flight Trainers -- Helicopter flight simulators for full instrument flight training. Includes full simulation of aircraft systems, motion, sound, and environment. Designed and developed for U. S. Air Force.

- Dead Reckoning Navigation Indicator, MK9 Mod 4 -- Operational shipboard equipment which continuously computes, transmits, and displays ship's principal navigation components. Mass produced for United States Naval Ships System Command and Italian Navy.

- Electronic Warfare Simulators (AN/ALQ-T3 and AN/ALQ-T4) -- Simulates entire electronic warfare environment of reconnaissance or attacking aircraft. Used for training operators and for evaluation of electronic warfare techiques. Developed and mass produced for U. S. Air Force.

- Radar Operator Training Complex (Device 15G16) -- Used for training operators in basics and advanced ground-controlled approach techniques. Students direct operation of simulated aircraft targets and observe results on the operational radar equipment. Developed for Army use. Applicable to civil airport complexes.

- CH-46F and SH-3H Cockpit Procedure Trainers -- Helicopter procedure trainers. Conversion of analog systems to digital systems including revisions and updates to new aircraft configurations. SH-3H is mobile; self contained in a single trailer. CH-46F is fixed base trainer.

Vought Corporation, Systems Division, of Dallas, Texas, has designed a number of military aircraft training simulators. Typical is the A-7E Weapons System Trainer. This system, built around an A-7E aircraft cockpit, simulates all modes of engine and fuel systems operation, automatic control systems, basic control systems, hydraulic and electrical systems and the flight quality and performance characteristics of the actual aircraft. Other simulated systems include the Inertial Measurement Set, Doppler Radar, Air Data Computer, Data Link, Communications Sets, Radar Altimeter, TACAN and Integrated Flight Instrument Systems. A wide variety of tactical situations can be simulated under control of an instructor. The student cockpit is represented on a 6 degree-of-freedom, 48 inch stroke, monitor system so that rotational and translational airframe motion cues are provided.

The A-7E's radar display is simulated through a digitally generated radar landmass system with a data base map 1250 x 1250 mm in area. The data base contains topographic, hydrographic and radar significant features to a resolution of 250 feet.

Other simulators made by Vought include an aircraft approach and landing simulator featuring a motion-base-mounted cockpit with a night scene of aircraft carrier landing lights and several air combat simulator systems which include two identical cockpits surrounded by spherical screens which each display an image of the opponent's aircraft. The images are computer generated and move in proper perspective and in accordance with the trainee's control motions.

COMPANIES SUPPLYING COMPONENTS OR SUBSYSTEMS USEFUL IN DESIGNING TRAINING SIMULATORS:

1. Aeronutronic Ford
2. Antekna Corporation
3. Austin
4. Cadillac Gage
5. Det Norske Veritas
6. Evans and Sutherland
7. Farrand
8. Foxboro/Trans-Sonics
9. Franklin Institute Research Labs
10. Honeywell
11. Hydrosystems, Inc.
12. Image Magnification, Inc.
13. Logicon, Inc.
14. Marconi Radar Systems
15. Martin-Marietta Aerospace
16. McDonnell-Douglas
17. Raytheon Company
18. Solartron Electronic Group, Ltd.
19. Thomas

Aeronutronic Ford Corporation - of Palo Alto, California, has developed a line of advanced television projectors. The specially designed CRT's produce high light output and resolution Special red, green and blue phosphors provide full-color images that are claimed by the manufacturer to be bighter and clearer than those obtained by earlier projectors.

The optics required for the projector system use a set of fully refractive, double gauss lenses. A standard lens provides a 9 x 12 foot or 6 x 8 foot image at a throw distance equal to twice the image width. Image resolution of a thousand horizontal lines of one thousand elements is produced and the result in color registration is better than 1/2 of a picture element (one line).

Antekna Corporation -- of Mountain View, California, is heavily involved in the development and production of EW simulators, such as ALQ-58, EW trainer, a programmable radar target simulator (RADPEX system) and many others.

The Austin Advanced Technology Systems Division - of Roselle, New Jersey, has developed a 40:1 zoom lens designed for use in simulator systems. One such device is used in the periscope view simulator of their submarine attack trainer. Austin has also developed SPASYN (Space Synchro), a short-to-medium range closed loop transducing system which has been applied to the Helmet Mounted Sight problem. They have also produced a development model CGI system using a general purpose minicomputer.

Aside from their perioscope trainer, they have produced various other trainers such as devices for amphibious landings, aircraft navigation, sonar, radar, gunfire spotting, aerial observation, celestial navigation and ASW tactics operations and procedures. They have also developed an operating model landmass simulator to provide all weather navigation and tactical training. This system can be adapted for surface ship use in harbour navigation and docking.

The Cadillac Gage Company - of Warren, Michigan, designs and poduces precision electro-hydraulic control devices for aerospace and defense applications. These systems can be applied to simulator motion bases for aircraft as well as marine type simulators.

Det Norske Veritas - of Oslo, Norway, has developed a general purpose computer program (SUPERSIM) for simulation of dynamic systems. They are also developing a GENeral Purpose SIMulator and SIMulation system (GENSIM2) the main element being SUPERSIM. The GENSIM2 program has been applied to steam power plants (STEAMSIM) and is being developed for other types of processes such as:

- Interactive man-machine communication
- Optimal simulator construction
- Reliability and safety analysis
- Reheat steam power plant simulator
- Ship maneuvering simulators
- Evaluation of information generation on color displays

Evans and Sutherland Computer Corporation - of Salt Lake City, Utah, designs and produces computer graphics hardware and software. A prime example of their software capabilities is the CAORF CGI system.

Evans and Sutherland systems are real-time systems with three-dimensional perspective capabilities for both wire-frame and color shading applications.

The Farrand Optical Company, Inc. - of Valhalla, New York, is active in the development of visual equipment related to training simulators. They have developed visual systems for NASA spacecraft simulators, military fighter aircraft, commercial aircraft, commercial aircraft and helicopter aircraft simulators.

The Farrand optical systems consisted of mirrors, lenses and beam splitters configured for direct viewing by the observer. The images are stored on film or model board and transmitted to the viewer via optical probe and CRT. This type of optical system is used in many space flight simulators.

The following paragraphs give a brief description of two Farrand optical systems:

- In Line Infinity Image Display System (Pancake Window) - This system provides a wide field of view (60 degree to 360 degree), with proper motion parallex and correct presentation of angles. The use of quarter wave and birefringent laminated plates positioned to cancel the unwanted image while favoring and permitting transmission suitably polarized, now passes through the polarizing desired infinity image.

- TV Infinity Display System for "Real World" Presentation - This system combines the Farrand "In Line Infinity Image Display System" (Pancake Window) and an image source which is a High Resolution CRT.

  These displays range from 60 degree to 360 degree Field of View, with single and multiple (composite) scene displays. This viewing system permits image positional accuracies from 10 arc seconds, for telescope star field simulation, to 12 arc minutes, for normal displays. Monochrome or color image presentations can be provided by this system.

Foxboro/Trans-Sonics, Inc., - of Burlington, Massachusetts, has developed a portable process simulator to aid in the training of plant process personnel. They are also developing an LNG Cargo system simulator. It consists of actual control room equipment -- consoles, controls and displays -representative of a modern 125,000 cubic meter LNG carrier supported by a mathematical model of the ship cargo system implemented in a digital computer. Modes of operation include tank inerting, cool down, loading, voyage, discharge, etc.

An extensive malfunction capability is provided whereby the instuctor can schedule one or several malfunctions to occur after selected time intervals.

The Franklin Institute Research Laboratories, - located in Philadelphia, Pennsylvania, is involved in the development of man-rated machines using electric and electro-hydraulic control systems. Listed below is a brief description of simulator-related systems they have developed.

V/STOL Simulator Motion Base -- developed for Sikorsky Aircrft for the evaluation of V/STOL aircraft designs. This system has a maximum vertical displacement of five feet, and approximately four feet independent displacements in the horizontal directions. Specified independent angular displacements from the mean positions are ±45 degrees in roll and pitch, and ±60 degrees in yaw. The payload is 2,000 pounds and the frequency response is of the order of 5 Hz.

Helicopter Simulator -- Six degree-of-freedom helicopter motion base designed to carry a full-scale Bell heliopter cockpit, two occupants and flight instrumentation.

Weapon-Vehicle Interface Simulator -- Six degree-of-freedom motion base designed to carry a weapons platform such as a helicopter hull or a combat-vehicle cupola with a mounted automatic weapon capable of being fired. This system was recently completed for the U. S. Army, Rock Island Arsenal, Illinois.

Pictorial Display for Helicopter Simulator -- It presents a picture, in color, that provides the illusion of motion in all six degrees of freedom. This system has recently been developed for the U. S. Army's Frankford Arsenal in Philadelphia, Pennsylvania.

The Honeywell Marine Systems Division - of West Covina, California, has developed the following systems:

- Device 14A2 is a computer-controlled training system capable of simulating a variety of tactical situations, vehicles, and environmental conditions to provide shore-based training for all members of the ASW/Combat Team operation (individual training, subteam training, intra- and inter-ship training). The 14A2 provides simulation of the sensors, tracking, fire control, air control, and weapon deployment systems normally found on ASW equipped vessels.

  The 3000-square-foot trainer is divided into six operating areas: Underwater Battery Plot, Combat Information Center, Launcher Captains Control Station, Conning Station, Computer and projection room, and the Problem Critique and Display Room.

- Device 14E19 is a Basic Sonar Operator Trainer developed by Honeywell that offers a high degree of realism, thus maximizing physical and operational characteristics of the AN/SQS-27CX Sonar System. Because Device 14E19 is designed to operate either in a stand-alone mode or in conjunction with the 14A2 series trainers, it fulfills training requirements for the individual sonar men, the sonar team, and the ASW team.

- Devices 14E25 and 14E25A Sonar Operator Trainers developed by Honeywell will train Sonarmen in the operation and tactical use of the AN/SQS-53 sonar system.

  The 14E25 is a modified Device 14E19 and has been configured for use as a dual-purpose trainer and may be used either as a 14E25 simulating the AN/SQS-53, or as a 14E19 simulating the AN/SQS-26CX simply by interchanging the face plates. The 14E25A has the added capability of providing team training through its interface with the Underwater Fire Control System MK116 and TACDEW (Tactical Advanced Combat Direction and Electronic Warfare) training complexes.

- Device 14E24 Sonar Operator Trainer developed by Honeywell utilizes interactive graphic displays and data entry keyboards in an ASW instructors console facilitating the instructor's task of problem control and monitoring of trainee performance.

  The 14E24 simulates the shipboard operational AN/SQQ(PAIR) Sonar System and provides digital simulation of the complete underwater acoustic environment (sea state, bottom depth and type, rain, deep scattering layer, targets, random echoes, reverberations, and biological targets). The 14E24 includes an instructor console and two complete operator sections, permitting simultaneous training for two separate and independent sonar crews.

- Device 14E23 Sonar Operator Trainer developed by Honeywell trains the Independent Variable Depth Sonar (IVDS) team as individual operators, as members of the AN/SQS-35 sonar team. The trainer is a simulation device that precisely represents the physical and functional characteristics of the operational AN/SQS-35 equipment. It can be operated in a stand-alone mode or as a modular addition to the 14A2 series trainers. This system develops sonarmen proficiency for a wide array of tactical situations, including:

Ownship operation by itself

Ownship operation with one target
Ownship
Ownship operation with multiple targets

Ownship operation with biological targets

Deceptive targets and weapons

Hydrosystems, Inc. - of Farmingdale, New York, designs and manufactures a wide range of simulators and simulated instruments for naval and air training devices. Listed below is a brief description of simulators they have produced.

Device 21C5 - Submerged Control Trainer. The purpose of this device is to train submarine personnel in advanced emergency ship control procedures necessary to recover a 637 class nuclear submarine from casualty conditions in all modes of operation and at any operational depth.

It consists of a semi-enclosed trainer platform mounted on gimbals to provide a motion base. The diving trainer provides controls and indicators that simulate casualties in various control and propulsion systems.

Device 21B20/20A Advance Submerged Control Trainer. These devices provide simultaneous training of crews for two different class submarines. The gimbal mounted platforms provide from 0 to 30 degrees of roll and 0 to 45 degrees pitch. Semi-enclosed trainers are mounted on the platform.

The Trigger Class platform provides indicators necessary to train helmsmen, bow or stern planesmen, hydraulic and trim operator and air manifold operators.

The Flasher platform has an instrumented steering and diving station. It is also equipped with a facsimile ballast control station and provision for interchanging Conalog display units with Combined Instrument Panels (CIP). The trainer reproduces internal environment by activating all equipment that indicates maneuvers from surface to collapse depth. It can simulate surface and near-surface effects, wave action and bathythermal effects.

Both simulators are driven by the same general-purpose digital computer (a DDP-124) simultaneously on a time-share basis. This is also true for each instructor's console.

Hydrosystems has developed the E-2C Cockpit Procedures Trainer, Device 2C20A and the F-14A Cockpit Procedures Trainer Device 2C38A. Each system consists of an enclosed cockpit with an external instructors station, and is driven by a general-purpose digital computer.

Image Magnification, Inc. - of Verona, New Jersey, has designed, developed and manufactures cost-effective and reliable color video projectors as well as black and white video projectors. The color projector produces a picture ranging from 6' x 8' to 15' x 20' with a throw distance two times picture width. The black and white projector produces a picture ranging from 3' x 4' to 15' x 20' with a throw distance two times picture width.

Image resolutions for the color system are as follows:
500 lines center; 400 lines corner for the individual channel
500 lines corner center; 350 lines corner for registered RGB
320 lines for NTSC color

Image resolutions for the black and white system are 600 lines center, 450 lines corner (with 50% modulated video input).

Logicon, Inc. - of San Diego, California, is engaged in software development and systems planning. The Tactical and Training Systems Division has developed training systems for the miliary such as TACDEW (Tactical Advanced Combat Direction and Electronic Warfare) and TACS/TADS (Tactical Air Control Systems/ Tactical Air Defense Systrms). These systems, via telephone lines and NTDS, are capable of handling all simulated combat data required for a major military exercise.

The Multiple Units Link 11 Test and Operational Training System (MULTOTS) they have developed is used to certify tactical data systems and exercise crews in methods and procedures associated with Link-11 and other data link-associated test (evaluation) operations. Logicon is also involved with Automated Adaptive Flight Training Systems (AFTS) and speech understanding systems. Logicon is currently conducting a feasiblity study on an Automated Command Response Verification System for DOT. This system is being developed to record communications between conning officer and helmsman and ensure that all orders are properly executed.

Marconi Radar Systems, Ltd. - of New Parks, Leicester, England has designed a computer generated imagery (CGI) system for use with a number of simulators to provide the final display. Named TEPIGEN (television picture generator), this system can provide the following features in a simulator designed for maneuvering in coastal areas:

Day Scene -
- Coasts and Islands
- Foreshore and Harbor Entrances
- Buildings and Landmarks
- Other Ships (independently controlled)
- Bow Wave and Wash of Other Ships
- Buoys
- Variation in Light Level from Noon to Twilight
- Correct Extinction of Lights and Shapes with Reductions in Visibility by Fog
- Sea Surfaces Corresponding to Sea State
- Sea Surfaces Moving Past Own Ship
- Own Ship's Bow

Night Scene -
- As in day scene with light level reduced, unlighted objects no longer visible, landmasses and landmarks showing against sky.

Additional Imagery (Lights)
- Ships' Navigation Lights
- Flashing and Occulting Lights
- Shore Lighting
- Light Clusters (Harbors, Fishing Fleets)

This system can simulate own ship turning rate of 3°/sec. and a maximum passing speed of 60 knots at 3/4 mile range.

TEPIGEN can be provided with capacities between 500 and 5,000 faces of which 200 to 2,000 may appear as viewed faces at any one time. These visuals are normally projected on a 625 line TV standard. A single system provides three adjacent pictures which can be projected onto a continuous screen corresponding to 110° horizontally and 30° vertically.

Martin Marietta Aerospace - Orlando Division of Orlando, Florida, is working with communications systems and their development. They have designed a trailerable testing system (AN/TTM-3) capable of testing the TTC-39 and other inventory automatic circuit and message switches. It simulates all digital and analog instruments and message terminals. It also handles all AUTODIN modes and is expandable in capacity and function. Maintenance is aided by built-in diagnostic programs.

McDonnell-Douglas Electronics Company - of St. Charles, Missouri, has developed a CGI system called VITAL III. The system-generated shaded surfaces as well as light points are presented via a beam penetration CRT. VITAL III operates from a stored data base of 150 surfaces to compute and display at any one instant a total of up to 40. New scenes are computed at 30 frames per second, to assure a smooth responsive image.

The Raytheon Company - Marine Systems Division of Portsmouth, Rhode Island, has developed the LOADMAX Multipoint Digital Loading Computer System. The LOADMAX is a computerized predictive loading instrument for maritime applications to accurately perform ship loading and stability calculations.

The vessel's general arrangement and hydrostatic characteristics are permanently programmed into the instrument. The instrument is digital in operation and uses a microprocessor as the controlling element. LOADMAX is applicable to any type of ship but is particularly useful for ULC, VLCC, LNG, LASH, RO-RO, container ships, dry cargo ships and drilling vessels.

A calculator type keyboard permits the operator rapidly to address and enter tonnages for individual cargo, ballast and consumable liquid tanks, and for dry cargo locations. From the vessel's hydrostatic data and the longitudinal and vertical centers of gravity of each tonnage location, LOADMAX calculates the vessel's draft, trim, deadweight, stability, shear forces, bending moments, and other customer-designated variables.

Calculated results and front panel displays are automatically updated for every change in the vessel's tonnage entered through the keyboard.

LOADMAX-100 performs shear force, bending moment, draft and displacement (or deadweight) computations. LOADMAX-200 performs stability calculations as well as the basic LOADMAX-100 functions.

The LOADMAX system can be used as a simulator for training as well as an onboard working device.

<u>Solartron Electronic Group, Ltd.</u> - of Farnborough, England, have manufacturered several Marine Radar Simulators as well as a variety of other systems useful in large scale simulators. The two types of particular interest are:

SY 2080 Manual Digital Marine Simulator
SY 2084 Programmable Marine Radar Simulator

The SY 2080 manually controlled digital marine radar simulator can be linked to a high accuracy coastline generator to provide a system capable of expansion to a maximum of 32 vessels of which eight can be own-ships. Sea clutter, mast or funnel blanking and other radar phenomena can be produced on the display. The effects of tidal stream and variable own-ship characteristics can be created. The SY 2080 provides a gaming area of 600 x 600 miles.

The SY 2084 incorporates a general purpose digital computer so that own-ships (up to eight) and targets (up to 256) may be pre-programmed to follow planned tracks. The instructor can transfer own-ships or targets to manual control at any time. The system allows for the simulation of such navigation aids as Decca Navigator (Type 21), RDF, Loran A and C and Omega. A gaming area of 1,000 x 1,000 miles is provided.

Solartron also manufactures a number of subsystems which may be useful in the design of a large scale simulator.

SY 2058 and SY 2076 are coastline generators which provide a simulated radar display of coastal features by scanning photographic plates with flying spot scanners. SY 2096 is a navigation aids trainer in which the student can call up a representation of any navigation aid on a graphical display and obtain readings.

<u>Thomas Electronics, Inc.</u> - of Wayne, New Jersey, designs and manufactures special purpose CRT's which fall into three categories:

(1) Large high brightness tubes with optically curved face plates for use in conjunction with collimating windows.

(2) Direct view color CRT's primarily for night scene flight training.

(3) Very high brightness projection CRT's.

They developed the 36-inch CRT now being used in the Air Force ASUPT program.

A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY BE EFFECTIVELY APPLIED TO THE ACCOMPLISHMENT OF COAST GUARD VESSEL OPERATIONAL TRAINING

CONTRACT DOT-CG-61814A

APPENDIX C

DEVELOPMENT OF SIMULATOR CONFIGURATION FOR COST COMPARISON

PREPARED FOR

U. S. Coast Guard
400 Seventh Street, S.W.
Washington, D.C. 20590

PREPARED BY

Applied Digital Communications
214 West Main Street
Moorestown, New Jersey 08057

April 30, 1977

Rev. 7-21-77

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APPENDIX C

DEVELOPMENT OF SIMULATOR CONFIGURATION FOR COST COMPARISON

C1.0 INTRODUCTION

The development of the simulator configuration required a four-step approach with two supporting data bases as shown in Figure C-1. These steps and the data to support them are described in succeeding paragraphs with the supporting tabulated data developed for the effort.

Appendix C represents the detail information that was generated to provide the definition for the 378 ship simulator development. Many subjective judgments were made in order to quickly handle the mass of data to provide the basis for the new simulator training system. Subsequent re-analysis of this same data with a more objective, analytical and in-depth effort would undoubtedly alter the detail of this analysis but the overall conclusions would remain the same.

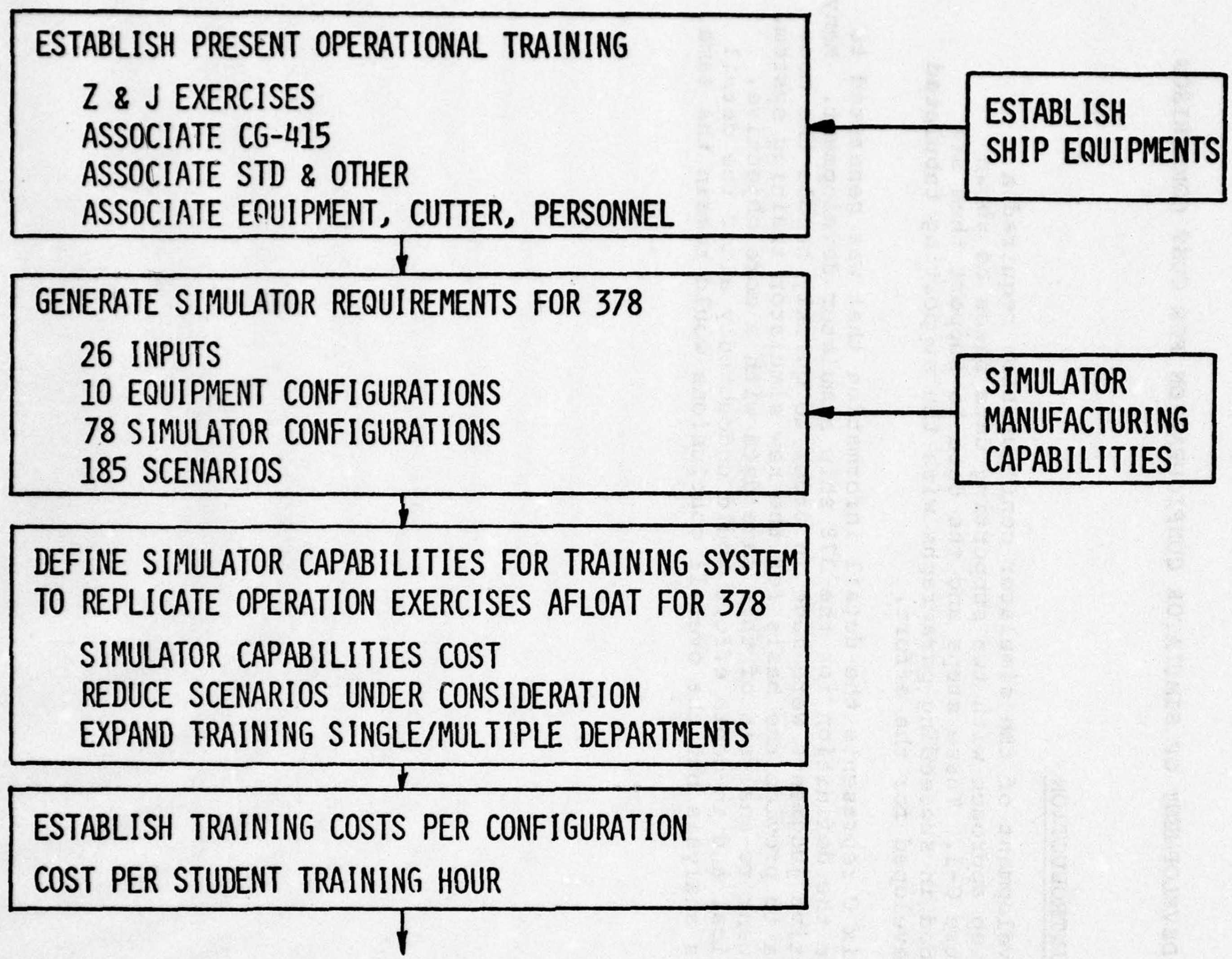

FIGURE C-1. DEVELOPMENT OF SIMULATOR CONFIGURATION FOR COST COMPARISON

C2.0 ESTABLISH PRESENT OPERATIONAL TRAINING

The predominant measure of performance in the present USCG training system is REFTRA, consisting of exercises performed underway and graded by the Navy instructors. The exercises were analyzed and grouped to form training requirements. For each exercise the following was obtained:

Reference Number - upper lefthand corner
Title:
Purpose:
Related Exercises: CG415-2LPO
CG415-4LPO
COMLANTAREA - OPLAN
CG415-3
CG-260-8
CAAINST3500
CG-419
STD Curriculum
CG-260-7

Associated Equipment: For the 378 obtained from an analysis outlined under Paragraph C2.1.
Cutter Allocation: Which ships required?
Manpower Allocation: Who does the exercise? (378 only)
Evaluation: What is required to be acceptable?

There were 136 Z and J REFTRA exercises considered and 101 of these were analyzed further after the preliminary set was developed. These were correlated with 94 lesson plans from CG415 for the 101 REFTRA evaluation exercises. There were an additional 29 lesson plans correlated with the 36 REFTRA exercises which were not evaluated further for simulator training.

The purpose of the following listed tabulations of present training (pages C-4 to C-92) was to correlate the present training (operational) with the personnel, the equipment and the evaluation critical for each training requirement. This was done in order to generate the requirements for a simulator approach to provide the same training. The manpower allocation is indicative for the 378 cutter only.

2. J-1-CC DRT Failure

Purpose: Train DRT (Dead Reckoning Tracer) operators to maintain a geographic plot when the DRT fails.

Related: CG415-2 LPO's: 0-037 Dead Reckoning
0-108 DRT Plotting Symbols
0-114 Geographic Plot
0-115 Geographic Plotting Drill
0-116 DRT Adjustment Drill
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

DRT (Dead Reckoning Tracer) MK6M4A
Indicator Analyzer MK9M2
DR14I Dead Reckoning Analyzer
SSP Surface Summary Plot

Cutter Allocation

WHEC 378
WHEC (255,327)
WMEC 210

Manpower Allocation

XO, CIC/EW, Elect., 4 Enlisted

(continued on next page)

2. (continued)
J-1-CC DRT Failure

Evaluation:

(a) If own ship is maneuvering and difference between DR position and position of bug at the end of observation period is:

Difference	Score
0 - 100 yards	100
101 - 300 yards	90
301 - 500 yards	80
501 - 700 yards	70
701 - 1000 yards	63
>1000 yards	0

(b) If own ship is on a steady course and speed for entire observation and the difference between DR position and the bug is:

Difference	Score
0 - 100	100
>100	0

3. Z-10/11-CC Surface Tracking

Purpose: Train CIC personnel in tracking surface contacts to determine course, speed and CPA.

Related: CG415-2 LPO's:
- 0-111 Surface Plotting
- 0-112 Summary Plot
- 0-113 Summary Plotting Drill
- 0-117 Surface Tracking and Safe Maneuvering-Multiple Targets
- 0-020 Maneuvering Board
- 0-110 Maneuvering Board
- 0-118 Maneuvering Board Drill - In and Out Problems
- 0-119 Maneuvering Board Drill - Station Changes
- 0-120 Maneuvering Board Drill - Formation Changes
- 0-106 Wind Problems
- 0-107 CIC Air Plot
- 0-150 Ditch and Rescue (Drill)

STD Curriculum: Multiple Surface Contacts--3 hours for RD's,QM's and OOD's
Maneuvering Board Problems--3/6 hrs for RD's, QM's and OOD'

COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Radar, Surface Search, SPS-51
DRT (Dead Reckoning Tracer) MK6M4A
Maneuvering Board
Indicator Group, SPA-66
Indicator Analyzer, MK9M2
SSP, Surface Summary Plot
DRAI, Dead Reckoning Analyzer
Sound Powered Phone
Dial telephone system IC/TDX-40G

Evaluation:

1. Accuracy in determining target's speed.
2. Accuracy in determining target's course, using radar-PPI.
3. Evaluation of DRT plot and/or maneuvering board plot and contact log. Accuracy and adequacy of the plot.
4. Dissemination of reports and information.

Cutter Allocation

WHEC 378
WHEC (255,327)
WMEC 210

Manpower Allocation

XO, CIC/EW, 3 Enlisted

5. Z-13-CC <u>Tactical Maneuvers</u>

Purpose: Train CIC personnel in assisting CONN during tactical maneuvers.

STD Curriculum: Maneuvering Board Problems--3/6 hrs. for RD's,QM's and OOD
GQ Problem (Mockup)--3/6 hrs. for CIC team, lookout, bridge JA phone talker, OOD, CO

Related: COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u> (Typical WHEC)

Maneuvering board
DRT (Dead Reckoning Tracer) MK6M4A
Dial Telephone Net, IC/TDX-40G
Radar, Surface Search SPS-51
Indicator Group, SPA-66
Indicator Analyzer, MK9M2
DRAI Dead Reckoning Analyzer
SSP Surface Summary Plot
Sound Powered Phones

<u>Evaluation:</u>

Solution of the maneuvering board problem. For simulated and actual maneuvers, solve course and speed required to gain new station, and bearing and distance of closest point of approach (CPA) to a designated ship from the maneuvering ship.

<u>Cutter Allocation</u>

WHEC 378
WHEC (255,327)
WLB
WAGO 295
WMEC 210
WMEC (Tugs & WAGO 167)

<u>Manpower Allocation</u>

CO, XO, OPS/Navigator, Comm, CIC/EW, 30 Enlisted

6. Z-14-CC CIC Assistance in Piloting and Anchoring

Purpose: Train CIC personnel to furnish informtion to conning officer for maneuvering ship in restricted waters in low visibility.

Related: CG415-2 LPO's: 0-140 Radar Assisted Piloting, Precision Anchoring

0-139 Radar Navigation

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

STD Curriculum: Radar Navigation--3/6 hrs. for CIC Fog Nav team, lookout, bridge JA phone talker, OOD and CO
Maneuvering Board Problems--3/6 hrs. for RD's, QM's and OOD's

Associated Equipment (Typical WHEC)

Maneuvering board
Radar, Surface Search, SPS-51
Dial Telephone Net, IC/TDX-40G
Indicator Group, SPA-66
DRT (Dead Reckoning Tracer) MK6M4A
Indicator Analyzer, MK9M2
DRAI Dead Reckoning Analyzer
SSP Surface Summary Plot
Sound Powered Phones

Evaluation:

1. Adequacy of preparation.
2. Accuracy of navigational plot.
3. Exchange of information with conn.

Cutter Allocation

WHEC 378
WHEC (255,327)
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WPB
WLM

Manpower Allocation

CO, XO, OPS/NAV, COMM, CIC/EW, 50 Enlisted

35. Z-92-E Gyro Compass Casualty

Purpose: Train personnel for gyro compass casualty.

Related: CG415-2 LPO's: 0-126 Casualty Procedure
Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Radar, Surface Search, SPS-51
Dial Telephone Net, IC/TDX-40G
Indicator Group, SPA-66
DRT (Dead Reckoning Tracer) MK6M4A
Indicator Analyzer, MK9M2
DRAI, Dead Reckoning Analyzer
SSP, Surface Summary Plot

Evaluation:

1. Dissemination of reports and information.
2. Compliance with Procedures: action of watch to minimize damage, ability of watch to determine cause of loss of power, action of watch in restoring gyro compass to normal.

Phase 2:

1. Correctness of rudder orders and course orders when repeated.
2. Choice of rudder angle used when coming to a new course.
3. Ability to steady on new course.
4. Ability to steer a steady course.

Phase 3:

1. Radar navigation
2. Tracking contacts
3. Target designation to gun control

Cutter Allocation

WHEC 255
WHEC 327
WHEC 378
WMEC 210
WAGB
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WLM

Manpower Allocation

OPS/NAV, CIC/EW, Eng. 4 Enlisted

8. Z-4-CC A/C Control - Lost Plane Homing

Purpose: Train personnel to home a lost aircraft speedily and reliably

Related: CG415-2 LPO's: 0-226 Distress Communications
0-237 Radio Direction Finding Procedures

Associated Equipments (Typical WHEC)

Radio Set, AN/SRC-20
Radio Set SSB, AN/URC-51
Transceiver SSB HF, AN/URC-58V
Radio Set FM, AN/URC-80V
Radio Set, AN/URC-9
Receiving Set Radio, AN/URR-35
TRansmitting Set, AN/URT-20A
Transmitting Set Radio, AN/URT-32
Receiver Transmitter, RT-1035/GR
Transmitter Radio, T-827B/URT

Evaluation - None given.

Discover possible errors, by comparison at various ranges, in precision ranging PPI equipment and optical rangefinders.

Cutter Allocation

WHEC 378
WHEC (255,327)
LAMPS Configured

Manpower Allocation

XO, CIC/EW, Elect., 6 Enlisted

7. Z-1-CC Fade Chart Calibration and Radar and IFF Performance

Purpose: Phase I calibrates fade charts for air search radars. Phase II checks performance of air search radar, height finding radar and IFF.

Related: CG415-2 LPO's:
- 0-123 Procedure for Operation, Calibration and Tuning Search Radars and operation of IFF equipment
- 0-121 Capabilities and Limitations of Radar
- 0-122 Procedures for Starting and Securing Radar
- 0-128 Radar Control Orders, Guards and Searches
- 0-134 Test of IFF Equipment
- 0-125 Air Search Radar Operation

Associated Equipments (Typical WHEC)

Radar, Air Search
IFF Transponder Set Radar, AN/UPX-17, REcognition Set Radar AN/UPX-1
Radar, Height Finding

Evaluation - None given.

Phase 1 is used to calibrate fade charts for air search radars by tracking aircraft at various altitudes and to compare the altitude measured by the altitude-determining radars with the known altitude of aircraft being tracked.

Phase 2 is used to check the performance of air search radar, height finding radar, and IFF while fade charts are being calibrated.

Cutter Allocation

WHEC 378
WHEC (255,327)

Manpower Allocation

3 Enlisted

6a. Z-21-CC <u>Combined Air and Surface Tracking</u>

Purpose: Train CIC personnel in the simultaneous tracking of air and surface contacts to determine course, speed, and aircraft altitude.

Related: CG415-2 LOP's:
0-107 CIC Air Plot
0-111 Surface Plotting
0-112 Summary Plot
0-113 Summary Plotting Drill
0-117 Surface Tracking and Safe Maneuvering
0-125 Air Search Radar Operation
0-150 Ditch and Rescue (Drill)

STD Curriculum: GQ Problem (Mockup)--3/6 hours for CIC team, lookout, Bridge JA phone talker, OOD, CO

<u>Associated Equipment</u>

Radar, Surface Search, SPS-51
Radar, Air Search
Radar, Height Finding
DRT (Dead Reckoning Tracer) MK6M4A
Maneuvering Board
Indicator Group, SPA-66
Indicator Analyzer, MK9M2
SSP, Surface Summary Plot
DRAI, Dead Reckoning Analyzer
Sound Powered Phone
Dial telephone system IC/TDX-40G

<u>Cutter Allocation</u>

WHEC 378
WHEC (255, 327)
LAMPS Configured

<u>Manpower Allocation</u>

XO, CIC/EW, Elect., 6 Enlisted

6a. (continued) Z-21-CC Combined Air and Surface Tracking

Evaluation:

Did signal bridge personnel perform proficiently with a minimum of confusion?
Was the visual log maintained?
Did signalmen adhere to flashing light/infrared procedures as promulgated in ACP 129?
Was all necessary equipment operational and ready prior to commencement of the exercise?
Did signalmen demonstrate a working knowledge of all equipment installed?
Were effective communications between signalmen and OOD established (if applicable)?
Were letters and numbers transmitted correctly?
Did the operator(s) send and receive at the speed required of his rate?

45. Z-5-S <u>Getting Underway with Duty Section</u>

Purpose: Train XO, head of department or watch officer in getting underway without assistance of key personnel.

Related: COMLANTAREA OPLAN 1-(FY)

<u>Associated Equipment</u> (Typical WHEC)

Telephone Net, IC/TDX-40G
Engine Order Telegraph
Helm Stand - Autopilot?
Rudder Angle Indicator
Gyro
Fathometer
Magnetic Compass
Rate of turn indicator
Wind speed and direction
VHF communications

<u>Evaluation:</u>

1. Preparation
2. Exercise of sound judgment in ship handling by conning officer.
3. Effective implementation of decisions of conning officer.
4. Effectiveness of interior communications.
5. Correct performance of duties.

<u>Cutter Allocation</u>

WHEC 378
WHEC 255
WHEC 327
WMEC (Tugs & WAGO 167)
WLB
WMEC 210
WAGB

<u>Manpower Allocation</u>

1 Jr. Officer, 20 Enlisted

58. Z-1-ET <u>Preparation of Getting Underway</u>

Purpose: Train personnel in preparation for getting underway.

Related: CG415-2 LPO's: 0-328 Preparation for Getting Underway
Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

All bridge, CIC, navigation equipment (energize and tune)

Evaluation:

1. Equipment checks
2. Missile hazards
3. Fire hazards
4. Reports
5. Inoperative major equipment
6. Inoperative minor equipment

Cutter Allocation

WHEC 378
WHEC (255,327)
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WPB
WYTM
WLM
WAGB

Manpower Allocation

CO, XO, OPS/NAV, COMM, CIC/EW, Elect. Eng., 125 Enlisted

37. J-1-N Steering - Magnetic Compass

Purpose: Train helmsmen to steer a course by magnetic compass.

Related: CG415-2 LPO's: 0-004 Magnetic Compass

0-032 Compensating the Magnetic Compasses

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment: (Typical WHEC)

Magnetic Compass
Dial Telephone Net IC/TDX-40G

Evaluation:

Correctness of rudder orders and course orders; choice of rudder angle when coming to new course, ability to steady on new course, ability to steer a steady course.

Cutter Allocation	Manpower Allocation
WHEC 378	OPS/NAV, 5 Enlisted
WHEC 255	
WHEC 327	
WMEC (Tugs & WAGO 167)	
WLB	
WMEC 210	
WAGB	
WAGO 295	
WPB	
WYTM	
WLM	
WLI	

36. Z-110-E Full Power Trial

Purpose: Run full power trial of four hours duration.

Related: CG415 LPO's: None

Associated Equipment

Evaluation:

1. Complete data taking and detailed drafting of trial report.
2. Compliance with good engineering practices and safety precautions.
3. Trial requirements.

Cutter Allocation

WHEC 378
WHEC (255, 327)
WMEC 210
WAGB

Manpower Allocation

XO, CO, Ops/Nav, CIC/EW
Engineer
15 Enlisted

51. Z-20-S <u>Helicopter Launching and Recovery</u>

Purpose: Train ships personnel in control of helicopters during landing and takeoff.

Related: CG415-3 LPO's: D-033 Helicopter Operations

CG260-7 Non-Combat Operational Bills 3209; Helicopter Operations Bill

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation:</u>

1. Expeditiousness of service
2. Smartness of execution
3. Planning for evolution
4. Uee of proper radio signals and visual signals
5. Proper action by conning officer

<u>Cutter Allocation</u>

WHEC 378

<u>Manpower Allocation</u>

CO, OPS/NAV, CIC/EW
25 Enlisted

53. Z-22-S Helicopter In-Flight Refueling

Purpose: Train ships personnel in HIFR procedures.

Related: CG419 Shipboard-Helicopter Operational Procedures; Annex B

Associated Equipment

HIFR fuel hoses, nozzles

Evaluation:

1. Planning for evolution
2. Performance of personnel

Cutter Allocation

WHEC 378

Manpower Allocation

CO, OPS/NAV
CIC, EW
25 Enlisted

65. Z-8-ET Use of Electronic Test Equipment

Purpose: Train personnel in use of test equipment during Z-7-ET.

CG415-2 LPO's: 0-317 AN/SPS-23 Surface Search Radar

0-318 AN/SPS-23 Surface Search PPI Adjustments

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Operating IP-306/SPS Bridge Repeater

Operating C-1543/SPS Control Indicator

AN/USM-162 Multimeter, AN/USM-177 Portable Oscillator

Evaluation:

1. Availability
2. Familiarity
3. Proper use
4. Reports

Cutter Allocation

All

Manpower Allocation

CO, XO, OPS/NAV
CIC/EW
25 Enlisted

42. Z-7-N <u>Low Visibility Piloting</u>

Purpose: Train ships personnel in procedure to conn the ship during low visibility in restricted waters.

Related: COMLANTAREA OPLAN 1-(FY)
CG415-2 LPO's: 0-015 Radar Navigation
0-140 Radar Assisted Piloting, Precision Anchoring
Proficiency Cruising CAAINST 3500.2A
CG415-3 LPO's: D-028 Piloting in Darkness or Reduced Visibility

STD Curriculum: Radar Navigation--3/6 hrs. for CIC Fog NAV team, lookout, bridge JA phone talker, OOD and CO
Maneuvering Board Problems--3/6 hrs. for RD's,QM's,OOD's
Rules of the Road--8 hrs. for RD's, QM's, OOD's, XO, CO

<u>Associated Equipment</u> (Typical WHEC)

Compass
Maneuvering Board
Radar, Surface Search, SPS-51
Dial Telephone Net, IC/TDX-40G
Indicator Group, SPA-66
DRT (Dead Reckoning Tracer) MK6M4A
Indicator Analyzer, MK9M2
DRAI, Dead Reckoning Analyzer
SSP, Surface Summary Plot
Receiving Set LORAN, AN/SPN-45, AN/UPN-23
Fathometer
Engine Order Telegraph

<u>Cutter Allocation</u>

WHEC 378 WPB
WHEC 255 WYTM
WHEC 327 WLM
WMEC (Tugs & WAGO 167)
WLB
WMEC 210
WAGB
WAGO 295

<u>Manpower Allocation</u>

CO, OPS/NAV, CIC/EW, 25 Enlisted

<u>Evaluation</u>:

1. Preparations
2. Conformance to rules of the road
3. Accuracy of navigation plot
4. Tracking and reporting of shipping
5. Exchange of information with conn

46. Z-6-S <u>Towing and Being Towed</u>

Purpose: Train personnel in proper towing procedures.

Related: CG415-3 LPO's: D-020 Towing Procedures

CG260-7 Non-Combat Operational Bills 3208; Towing
COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

Towing hawsers, heaving lines, line throwing guns, messenger lines.

<u>Evaluation:</u>

1. Preparation and equipment.
2. Preparation by deck force.
3. Performance of exercise.
4. Equipment provided.

<u>Cutter Allocation</u>

WHEC 378
WHEC (255, 327)
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

<u>Manpower Allocation</u>

XO, CO, Engineer
COMM, CIC
5 Officers
15 Enlisted

38. J-2-N Steering - Using Ships Engines

Purpose: Train conning officers to conn the ship using ships engines when rudder control is lost.

Related: CG 415-2 LPO's: 0-024 Steering Casualty Procedures
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Dial Telephone Net IC/TDX-40G.
Engine Order tèlegraph
Sound Powered Phones
Compass

Evaluation:

Ability to maintain course; with rudder amid ships
Ability to maintain course; with rudder right or left five degrees
Ability to maintain course; with rudder right or left ten degrees
Proper engine orders given.

Cutter Allocation

WHEC 378
WMEC 210
WPB
WLM
WLI
WLIC

Manpower Allocation

OPS/NAV, CIC/EW, Eng., 5 Enlisted

33. Z-90-E Steering Engine Casualty

Purpose: Simulated normal steering control loss.

Related: CG415-2 LPO's: 0-024 Steering Casualty Procedures

CG260-7 Non-Combat Operational Bills 5503; Steering Casualties

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Dissemination of information and reports.
2. Compliance with:
   Coordination, ability to shift steering control to alternate steering station, ability to shift steering engine.
   Ability to shift power supply, hand steering, maintain course with hand-powered steering, ability to restore normal steering control.

3. Time variation to shift to handpowered steering and move rudder 5 degrees right or left.

Cutter Allocation

WHEC 378
WHEC (255, 327)
WMEC 210
WAGB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

Manpower Allocation

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

34. Z-91-E Jammed Rudder

Purpose: Simulated rudder control loss with rudder jammed 5° right or left.

Related: CG415 LPO's: None

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Dissemination of reports and information.
2. Compliance with type casualty control procedures: ability to maintain course with main engines, action in regarining control of rudder.
3. Time variation from type standard in disengaging rudder from hydraulic.

Cutter Allocation

WHEC 378
WHEC (255, 327)
WMEC 210
WAGB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

Manpower Allocation

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

39. J-26-S Approach for Replenishment at Sea

Purpose: Train conning officers in approaching and keeping station on a replenishment ship.

Related:

CG260-7 Non-Combat Operational Bills 3202; Replishment at Sea

Associated Equipment (Typical WHEC)

Communications (Intership)
Dial Telephone Net, IC/TDX-40G
Engine Order Telegraph

Evaluation:

Extensive evaluation elements cover the broad categories: Preparations, Shiphandling, Communications

To train conning officers in approaching and keeping station on a replenishment ship prior to conducting actual RAS exercise or operation.

Cutter Allocation

WHEC 378
WHEC 255
WHEC 327
WMEC (other)
WMEC 210
WAGB

Manpower Allocation

CO, XO, COMM ENG., 40 Enlisted

40. Z-1-N **Piloting - Loss of Gyrocompass**

Purpose: Train navigation personnel in the use of magnetic compass, sonar, fathometer, etc.

Related: CG415-2 LPO's: 0-013 Fundamentals of Piloting

0-007 Gyro Compass, Gyro Repeater and Pelorus

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

STD Curriculum: Maneuvering Board Problems--3/6 hrs. for RD's, QM's, OOD's

Associated Equipment (Typical WHEC)

Master gyro, repeaters
Maneuvering board
Communications Set Sonar, AN/WQC-2
ASW Plotter, MK-NC-2 Mod 2A
Transducer Sonar, TR-231/SQS-38, TR-225/WQM, TR-229/SQS
Sonar Set Sounding, AN/SQN-13, AN/UQN-4
Sonobuoy, AN/SQQ-46A
Indicator Group, SPA 25
Fathometer
Dial Telephone Net, IC/TDX-40G
Engine Order Telegraph

Evaluation:

1. Preparation and readiness
2. Frequency of obtaining fixes
3. Accuracy of fixes
4. Usefulness of information to conning officer

Cutter Allocation

WHEC 378
WHEC 255
WHEC 327
WMEC (Tugs & WAGO 167)
WLB
WMEC 210
WAGB
WAGB
WAGO 295
WPB
WYTM
WLM
WLI

Manpower Allocation

OPS/NAV, 5 Enlisted

43. Z-3-S Anchoring or Mooring

Purpose: Train personnel in approaching an anchorage or mooring buoy.

Related: CG415-3 LPO's: D-038 Anchoring

D-012 Helmsman and Engine Order Telegraph

CG260-7 Non-Combat Operational Bills 3201; Special Sea Detail, Moving stations, Anchor Detail and Low Visibility Bill.

Associated Equipment (Typical WHEC)

Compass
Dial Telephone Net IC/TDX-40G
Engine Order Telegraph

Cutter Allocation

WHEC 378
WHEC 255
WHEC 327
WMEC (Tugs & WAGO 167)
WMEC 210

Manpower Allocation

CO, OPS/NAV, CIC/EW, 35 Enlisted

Evaluation:

1. Preparation
2. Judgment and skill in ship handling and in anticipating effects of wind and current.
3. Correctness of phraseology, and effectiveness of manner of conning officer in giving orders.
4. Performance of individuals on station
5. Effectiveness of interior communications.
6. Smartness, including military bearing of crew.
7. Observance of rules of the road.

47. Z-11-S <u>Man Overboard</u>

Purpose: Train personnel in man-overboard procedures.

Related: CG415-2 LPO's: 0-109 Man Overboard Procedures
COMLANTAREA OPLAN 1-(FY)
CG260-7 Emergency Bill 3304; Man Overboard
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u> (Typical WHEC)

DRT (Dead Reckoning Tracer) MK6M4A
Indicator Analyzer, MK9M2
DRAI, Dead Reckoning Analyzer
SSP, Surface Summary Plot
Halifax Plot

<u>Evaluation</u>:

1. Alertness of watch
2. Initial action of conning officer
3. Judgment and skill in ship handling
4. Effectiveness of personnel and equipment
5. Signals
6. Lack of excess noise and confusion
7. Accuracy of muster
8. Correctness of first aid
9. Elapsed time

Use of Lifeboat if necessary.

<u>Cutter Allocation</u>

WHEC 378
WHEC 255
WHEC 327
WMEC (Tugs & WAGO 167)
WLB
WMEC 210
WAGB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

<u>Manpower Allocation</u>

OPS/NAV, 35 Enlisted
CIC/EW

25. Z-6-D Rescue and Assistance

Purpose: Train rescue and assistance party in handling emergencies away from ship.

Related: CG415-2 LPO's: 0-151 Rescue of Survivors at Sea

CG260-7 Non-Combat Operational Bills 3203; Rescue and Assistance

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Rescue party properly organized and equipment working.
2. Ability of rescue party personnel to perform duties.
3. Time variation from type standard for dispatching rescue and assistance party.

Cutter Allocation

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295
WPB
WYTM
WLM

Manpower Allocation

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

49. Z-15-S <u>Visit and Search</u>

Purpose: Train personnel in conducting visit and search.

Related: CG415-3 LPO's: D-052 Boarding Procedures

CG260-7 Non-Combat Operational Bills 3207; Visit and Search, Boarding and Capture, Prize Crew Bill

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation:</u>

Judge performance and readiness on basis of effectiveness of application of international law.

1. Preparation
2. Procedures
3. Papers examined
4. Report
5. Equipment and personnel.

<u>Cutter Allocation</u>

WHEC 378
WHEC (255, 327)
WMEC 210
WMEC (Tugs and WAGO 167)
LEB
WAGB
WAGO 295
WPB
WLM

<u>Manpower Allocation</u>

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

AD-A056 766 APPLIED DIGITAL COMMUNICATIONS MOORESTOWN NJ F/G 13/10
A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY--ETC(U)
APR 77 D W HANNA, E W BOYLE, J F DESPANTZ DOT-CG-61814A

UNCLASSIFIED 3M080 USCG-C-1-77 NL

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50. Z-16-S <u>Boarding, Capture and Supplying a Prize Crew</u>

Purpose: Train personnel in proper procedures for boarding, capture and providing a prize crew.

Related: CG415-3 LPO's: D-052 Boarding Procedures

CG260-7 Non-Combat Operational Bills 3207; Visit and Search, Boarding and Capture, Prize Crew Bill

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation</u>:

1. Preparation
2. Performance (alert to sabotage, search, get ship underway, proper handling and guarding of prisoners)

<u>Cutter Allocation</u>

WHEC 378
WHEC (255, 327)
WMEC 210
WMEC (Tugs and WAGO 167)
WAGB
WAGO 295
WPB

<u>Manpower Allocation</u>

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

54. Z-26-S Underway Transfer

Purpose: Train personnel in transferring and receiving light freight, personnel or guard mail.

Related: CG415-3 LPO's: D-023 High Line Transfer

D-060 Boom Operation (Cargo)

CG260-7 Non-Combat Organizational Bills 3202; Replenishment at Sea Bill

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Line throwing gun, litter/chair, high lines

Evaluation:

1. Preparation
2. Performance of personnel
3. Ship handling
4. Deviation from type standards - time

Cutter Allocation

WHEC 378
WHEC (255, 327)
WMEC 210
WMEC (Tugs & WAGO 167)
WAGB
WAGO 295

Manpower Allocation

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

55. Z-28-S <u>Underway Provisioning, Rearming</u>

Purpose: Train personnel in provisioning and rearming while underway.

Related: CG415-3 LPO's: D-055 Underway Rearming

COMLANTAREA OPLAN 1-(FY)

<u>Associated Equipment:</u>

Highline (manila), highline (wire), housefall, Burton

<u>Evaluation:</u>

1. Preparation
2. Performance of personnel
3. Ship handling
4. Deviation from time standards

<u>Cutter Allocation</u>

WHEC 378
WHEC (255, 327)

<u>Manpower Allocation</u>

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

56. Z-29-S Underway Fueling (Receiving) from Oiler or Combatant

Purpose: Train personnel in fueling at sea from an oiler or combatant.

Related: CG415-3 LPO's: D-022 Fueling at Sea

COMLANTAREA OPLAN 1-(FY)

Associated Equipment

Re-fueling equipment, rig

Evaluation:

1. Preparation
2. Performance of personnel
3. Ship handling
4. Deviation from type time standards

Cutter Allocation

WHEC 378
WHEC (255, 327)
WMEC 210
WMEC (Tugs & WAGO 167)

Manpower Allocation

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

57. Z-31-S Emergency Breakaway during Underway Replenishment

Purpose: Train personnel in emergency breakaway procedures.

Related: CG415 LPO's: None
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Seamanship
2. Ship handling

Cutter Allocation

WHEC 378
WHEC (255, 327)
WMEC 210
WMEC (Tugs & WAGO 167)

Manpower Allocation

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

41. Z-5-N Precision Anchoring

Purpose: Train navigation personnel to bring ship to a precision anchorage.

Related: COMLANTAREA OPLAN 1-(FY)
CG415-2 LPO's: 0-140 Radar Assisted Piloting, Precision Anchoring
Proficiency Cruising CAAINST 3500.2A
CG415-2 LPO's: 0-016 Loran Navigation

STD Curriculum: Radar Navigation--3/6 hrs. for CIC Fog NAV team, lookout, bridge JA phone talker, OOD and CO
Maneuvering Board Problems--3/6 hrs. for RD's, QM's, OOD's

Associated Equipment (Typical WHEC)

Compass
Maneuvering Board
Radar, Surface Search, SPS-51
Dial Telephone Net, IC/TDX-40G
Indicator Group, SPA-66
DRT (Dead Reckoning Tracer) MK6M4A
Indicator Analyzer, MK9M2
DRAI, Dead Reckoning Analyzer
SSP, Surface Summary Plot
Receiving Set LORAN, AN/SPN-45, AN/UPN-23
Engine Order Telegraph

Evaluation:

1. Effectiveness of advance preparation.
2. Frequency and accuracy of fixes
3. Usefulness and accuracy of information to conning officer.
4. Accuracy of ship's position with relation to desired anchorage after anchoring.

Cutter Allocation

WHEC 378
WHEC 255
WHEC 327
WMEC (Tugs & WAGO 167)
WLB
WMEC 210
WAGB
WAGO 295
WPB
WYTM
WLM

Manpower Allocation

CO, OPS/NAV, CIC/EW, 35 Enlisted

44. Z-4-S <u>Mooring Alongside a Pier or Ship at Anchor</u>

Purpose: Train personnel in proper procedure and methods of ship handling.

Related: CG415-3 LPO's: D-008 Mooring Lines

D-009 Mooring and Unmooring

D-025 Receiving Boats Alongside

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

Various mooring lines and mooring equipment

<u>Evaluation</u>:

1. Preparation
2. Judgment and skill in ship handling and in anticipating effects of wind and current.
3. Correctness of phraseology and effectiveness of manner of conning officer in giving order.
4. Performance of individuals on station.
5. Observance of rules of the road.
6. Effectiveness of interior communications.
7. Smartness.

<u>Cutter Allocation</u>

WHEC 378
WHEC (225, 327)
WMEC 210
WMEC (Tugs & WAGO 167)
WAGB
WLB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

<u>Manpower Allocation</u>

CO, OPS/NAV, CIC/EW
35 Enlisted

52. Z-21-S <u>Vertical Replenishment</u>

Purpose: Train ships personnel in underway reprovisioning of ships by helicopter.

CG260-7 Non-Combat Operational Bills 3209; Helicopter Operations Bill

CG419 Shipboard-Helicopter Operational Procedures; Paragraph 560.

COMLANTAREA OPLAN 1-(FY)

Associated Equipment

Evaluation:

1. Preparation
2. Performance of personnel
3. Operational proficiency
4. Observance of safety precautions

Cutter Allocation

WHEC 378

Manpower Allocation

CO, XO, OPS/NAV, CIC/EW
35 Enlisted

4. Z-12-CC Tactical Voice Net Procedures

Purpose: Train Bridge and CIC personnel in proper operation of tactical short range voice nets.

Related: CG415-2 LPO's:

0-223 Tactical Voice Communications

0-224 Tactical CW Radio Communications

0-225 Internal Handling of Tactical Signals

0-152 Communications Equipment

0-153 Radio Telephone Procedure, Vocabulary and Circuit Discipline

0-156 Tactical Nets, Tactical Communications team, Flow of Tactical Radio and Visual Communications

0-157 Other CIC Radio Nets - Flow of Radio Information

0-158 ASW Communications

0-159 AAW Communications

STD Curriculum: Radio Telephone Procedures/Sound Powered Phone Procedures 3 hours for RD's, QM's, OOD's

Associated Equipment (Typical WHEC)

Radio Set, AN/SRC-20
Radio Set SSB, AN/URC-51
Transceiver SSB HF, AN/URC-58V
Radio Set FM, AN/URC-80V
Radio Set, AN/URC-9
Transmitting Set Radio, AW/URT-32
Receiver-Transmitter, RT-790/URC-58
Switchboard Patching Comm SB-2744/SRT
Switchboard Patching Comm SB-2744/SRT

Cutter Allocation

WHEC 378
WHEC (255,327)
WLB
WMEC 210
WMEC (Tugs & WAGO 167)

Manpower Allocation

OPS/NAV, COMM, CIC/EW, 4 Enlisted

(continued on next page)

4. (continued)
Z-12-CC Tactical Voice Net Procedures

Evaluation:

1. Effective editions of authentication tables, ATP 1)A), Vol II, numeral codes, and other necessary publications readily available at each required position.
2. Proper voice procedures used IAW with ACP 125
3. Tactical signals decoded/encoded correctly.
4. Logs properly maintained by either tape recorder or manual system.
5. Information exchanged between bridge and CIC satisfactorily.
6. Authentication used correctly.
7. Numeral and operational codes used correctly.

19. Z-14-C <u>CW Circuit Operating Procedures and CW Reception</u>

Purpose: Train and evaluate ships operating procedures used on military and international CW net(s)/termination(s), and also shipboard operators in transmission and reception of CW.

Related: CG415-2 LPO's: 0-206 Radiotelegraph Procedures
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u> (Typical WHEC)

Transmitting Set, AN/URT-20A
Receiver Radio, R-1051E/URR
Receiver Radio, R-390A/URR
Transmitter Radio, T-827B/URT

<u>Evaluation</u>:

1. Preparation
2. Personnel performance
3. System capability

<u>Cutter Allocation</u>

WMEC 210
WHEC
WMEC (Tugs & WAGO 167)
WAGB

<u>Manpower Allocation</u>

1 Enlisted

10. J-1-CS Communications Security (COMSEC)

Purpose: Evaluate shipboard voice communications from the standpoint of preparations, security and radio-telegraph (R/T) procedures.

Related: CG415-2 LPO's: 0-211 Coast Guard - Navy Communications System

0-218 Auxiliary and Special Equipment

0-229 Calibration and Tuning (HF and MF)

0-230 Casualties, Failures and Use of Emergency Equipment

0-238 Adjust and Calibrate Transmitters and REceivers

0-242 Rigging Emergency Antenna

Associated Equipments (Typical WHEC)

Unknown

Evaluation:

a. Preparation - Necessary publications are available at each R/T.

b. COMSEC Procedures - Proper training in elements of COMSEC procedures.

c. Radiotelephone Procedures - Proper prewords, call-up procedures and circuit discipline.

Cutter Allocation

WMEC 210
WHEC
WMEC (Tugs & WAGO 167)
WLB
WAGB

Manpower Allocation

1 Enlisted

11. Z-1-C **Systems Control - Fleet Broadcast**

Purpose: Train and evaluate personnel in establishing and maintaining the shipboard multiplex and/or fleet broadcast half-duplex system,

Related: COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Converter-Comparator GR, AN/URA-17
Receiving Set Radio, AN/WRR-3B
Receiver Radio, R-1051E/URR
Receiver Radio, R-390A/URR

Evaluation

1. Theory of operation
2. Demonstration of ability
3. System performance
4. Organization

Cutter Allocation

WHEC
WAGB
WMEC 210

Manpower Allocation

1 Enlisted

12. Z-2-C <u>Systems Control - Ship Termination Exercise for B,C,D, G and P Systems</u>

Purpose: Train and evaluate personnel in establishing and maintaining the shipboard terminations.

Related: COMLANTAREA OPLAN 1-(FY)

Associated Equipment (Typical WHEC)

Converter-Comparator GR, AN/URA-17
Receiving Set Radio, AN/WRR-3B
REceiver Radio, R-1051E/URR
Receiver Radio, R-390A/URR

Evaluation:

None listed.

Cutter Allocation	Manpower Allocation
WMEC 210	2 Enlisted
WHEC	
WMEC (Tugs & WAGO 295)	
WAGB	

Z-2-C
Systems Control-Ship Termination Exercise for B,C,D,G, and P Systems

Purpose:

Train and evaluate personnel in establishing and maintaining the shipboard terminations.

Train and evaluate the quality control analysis procedures and performance of personnel in maintaining efficient termination.

Evaluation:

1. Theory of operation: Can the controller/watch supervisor demonstrate his knowledge of the system by: Drawing a block diagram which includes: Identification of all equipment and distribution panel; correct relationship of all equipment and distribtuion panels; correct input/output signals and their direction of flow; explain the procedures to accomplish tone blocking (P System only).
2. Techniques and procedures: Does the controller/watch supervisor perform the following functions using proper techniques and procedures?
3. System performance: Does the signal quality conform to the following operational standards:
   Do teletype printers provide readable page copy?
   Does the receiver operate within allowable limits for assigned frequency?
   Is the receiver audio level maintained at 0 dB?
   Are both BLACK and RED receiver DC teletype loops maintained at 60 ma?
   Is the percentage of loop distortion maintained below 10% distortion in both BLACK and RED receive teletype loops?
   Does the transmitter operate within prescribed tolerance of the assigned frequency?
   Is the transmitter modulation/audio input level maintained at the proper level for the system used?
   Is the percentage of loop distortion maintained below 10% in both BLACK and RED transmit teletype loops?
   Is the transmitter properly set up for the mode of operation used?
   Are the operating frequencies checked periodically for interference from other signals?
   Are both BLACK and RED transmit DC teletype loops maintained at 60 ma?
   Are the system's operating frequencies sufficiently separated from other shipboard operating frequencies to prevent interference between systems?
   Are equipment front panel meters checked periodically in maintaining signal standards?
4. Organization: Does the communications organization provide for ensurance of signal quality.

14. Z-4-C Systems Control - Non Secure Voice (SSB or AM)

Purpose: Train and evaluate personnel in establishing and maintaining the shipboard non-secure voice (SSB or AM) system.

Related: CG415-2 LPO's: 0-135 Communications Equipment

CG415-4 LOP's: DC-002 Communications Casualties

Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Radio Set SSB, AN/URC-51, Transceiver SSB HF, AN/URC-58V
Communications Set SONAR AN/WQC-2

Evaluation:

1. Theory of operation
2. Techniques and procedures
3. System performance
4. Organization

Cutter Allocation

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)

Manpower Allocation

2 Enlisted

18. Z-13-C **Teletype Circuit Procedures**

Purpose: Evaluate circuit operating procedures on teletype nets/ terminations and capacity of nets for high volume traffic.

Related: COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Term Set Radio Teletype, AN/SGC-1A
Teletypewriter Set AN/UGC-25A
Teletypewriter Set CTT-28-ASR-AUX

Evaluation:

1. Preparation
2. Personnel performance
3. System capability

Cutter Allocation

WMEC 210
WHEC
WMEC (Tugs & WAGO 167)
WAGB

Manpower Allocation

1 Enlisted

23. Z-30-C <u>Administrative Voice Net</u>

Purpose: Train and evaluate personnel in handling administrative communications over voice radio nets.

Related: CG415-2 LPO's: 0-047 Voice Radio Communications
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u> (Typical WHEC)

Radio Set, AN/SRC-20
Radio Set SSB, AN/URC-51
Transceiver SSB HF, AN/URC-58V
Radio Set FM, AN/URC-80V
Radio Set, AN/URC-9
Transmitting Set Radio, AN/URT-32
Receiver Radio, R-390A/URR
Receiver-Transmitter, RT-790/URC-58
Switchboard Patching Comm, SB-2727/SRR

<u>Evaluation:</u>

1. Organization
2. Personnel performance

<u>Cutter Allocation</u>	<u>Manpower Allocation</u>
WMEC 210	1 Enlisted
WHEC	
WMEC (Tugs & WAGO 167)	
WLB	
WAGB	
WAGO 295	

72. Z-15-ET **Sound Powered Phone Casualty**

Purpose: Train personnel how to react to a sound-powered phone system failure.

Related: CG415 LPO's: 0-314 Sound Powered Phone Procedure

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

STD Curriculum: Radio Telephone Procedures/Sound Powered Phone Procedures-3 hrs. for RD's, QM's and OOD's

Associated Equipment (Typical WHEC)

Sound Powered Phone Handset
Sound Powered Phone headset
Sound Powered Phone Jack-box

Evaluation:

1. Detected loss
2. Investigated cause and extent of damage
3. Took corrective action

Cutter Allocation

WHEC 378
WHEC (255,327)
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WPB
WYTM
WLM
WAGB

Manpower Allocation

2 Enlisted

15. Z-10-C **Message Processing - Outgoing Teletype Message**

Purpose: Train and evaluate the ships communications team in processing a large volume of outgoing record communications under simulated wartime conditions.

Related: Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Term Set Radio Teletype, AN/SGC-1A
Teletypewriter Set AN/UGC-25A
Teletypewriter Set CTT-28-ASR-AUX

Evaluation:

1. Outgoing message traffic.
2. Personnel performance.
3. Processing system efficiency.
4. System Capability
5. Processing system configuration.

Cutter Allocation

WMEC 210
WHEC
WMEC (Tugs & WAGO 167)
WAGB

Manpower Allocation

2 Enlisted

16. Z-11-C <u>Message Processing - Incoming Message Traffic</u>

Purpose: Train and evaluate the ships communications team in processing a large volume of incoming record communications under simulated wartime conditions.

Related: Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>: (Typical WHEC)

Term Set Radio Teletype, AN/SGC-1A
Teletypewriter Set AN/UGC-25A
Teletypewriter Set CTT-28-ASR-AUX

<u>Evaluation</u>:

1. Organization
2. Personnel performance
3. Processing system efficiency
4. System capability

<u>Cutter Allocation</u>

WMEC 210
WHEC
WLB
WMEC (Tugs & WAGO 167)
WAGB

<u>Manpower Allocation</u>

2 Enlisted

13. Z-3-C <u>Systems Control - Secure Voice Systems (Narrowband HF - Steamvalve-Wideband UHF)</u>

Purpose: Train and evaluate personnel in establishing and maintaining the shipboard secure voice system.

<u>Associated Equipment</u> (Typical WHEC)

Unknown

<u>Evaluation</u>:

1. Theory of operation
2. Techniques and procedures
3. System performance
4. Organization

Train and evaluate the quality control analysis procedures and performance of personnel in maintaining efficient operation of the secure voice system.

<u>Cutter Allocation</u>	<u>Manpower Allocation</u>
WHEC	1 Enlisted
WAGB	

17. Z-12-C <u>Message Processing - Offline Crypto Board Evaluation</u>

Purpose: Train and evaluate the ships crypto board in ADONIS offline crypto graphic procedures.

Related: CG415-2 LPO's: 0-234 Cryptocenter Message Processing and Procedures

0-231 Shackle Cipher

0-232 Call Sign Encryption

0-233 Encrypted Traffic Handling

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u> (Typical WHEC)

None

<u>Evaluation</u>:

Crypto operators test

<u>Cutter Allocation</u>	<u>Manpower Allocation</u>
WMEC 210 WHEC WMEC (Tugs & WAGO 167) WAGB	2 Enlisted

32. Z-83-E Use of Emergency Diesel Generator

Purpose: Simulated casualty to ship's service generators for training on emergency generator.

Related: CG415 LPO's: None
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Proper dissemination of information and reports
2. Compliance with type casualty control procedures

Cutter Allocation

WHEC 378
WHEC (255,327)
WMEC 210
WAGB
WAGO 295
WLM

Manpower Allocation

Engineer and 3 Enlisted

66. Z-9-ET <u>Equipment Casualty Repair during Loss of Lighting</u>

Purpose: Train personnel to investigate casualties to equipment and make repairs when normal lighting is lost.

Related: CG415 LPO!s: None

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation</u>:

1. Availability of emergency lighting
2. Use of emergency lighting
3. Effectiveness of action

<u>Cutter Allocation</u>

All

<u>Manpower Allocation</u>

Engineer + 3 Enlisted

70. Z-13-ET Use of Alternate Power

Purpose: Train personnel in proper use of alternate power.

Related: CG415 LPO's: None
Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Determined normal pwr lost and alternate available
2. Checked equipment switches for changeover
3. Switched to alternate
4. Energized equipment proptly and properly
5. Reports

Cutter Allocation

All

Manpower Allocation

Engineer + 3 Enlisted

71. Z-14-ET Use of Emergency Power

Purpose: Train personnel in proper use of emergency power.

Related: CG415 LPO's: None

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Determined normal and alternate power lost and emergency power available.
2. Secured all equipment
3. Knew output of emergency generator
4. Energized vital equipment; knew power requirements
5. Reports.

Cutter Allocation

All

Manpower Allocation

Engineer + 3 Enlisted

73. Z-16-ET **Secondary Electronic Casualty Control**

Purpose: Train personnel in the proper procedure for transfer of responsibility for electronics casualty control during General Quarters.

Related: CG 415-2 LPO's: 0-313 Battle Organization

Cutter Allocation

WHEC 378
WHEC 327

Manpower Allocation

Engineer + 3 Enlisted

Evaluation:

None listed.

74. Z-17-ET <u>Performance of Electronic Casualty Center</u>

Purpose: Train personnel at ECC to maintain an efficient casualty control system.

Related: CG415 LPO's: None

<u>Manpower Allocation</u>

Engineer + 3 Enlisted

<u>Cutter Allocation</u>

WHEC 378
WHEC 327

<u>Manpower Allocation</u>

Engineer + 3 Enlisted

<u>Evaluation</u>:

None listed.

Package "B" Diesel Propulsion

Z Number	Title
Z-25-E	Locking and Unlocking Shaft Underway
Z-27-E	Hot Bearing
Z-29-E	High Oil Level in Main Reduction Gear Casing
Z-60-E	Starting Air Compressor Failure
Z-61-E	Engine Fails to Start or to Come Up to Speed
Z-62-E	Main Engine Remote Control Inoperative
Z-64-E	Governor Failure
Z-65-E	Fuel Oil System Casualty
Z-67-E	Lubricating Oil System Casualty
Z-68-E	Unusual Noise or Vibration
Z-71-E	Low Lubricating Oil Pressure to Hydraulic Clutch or Loss of Power to Electrical Clutch
Z-80-E	Synchronizing Alternators or Paralleling Generators
Z-81-E	Generator Overloads
Z-82-E	Cutting Out Generator in an Emergency
Z-83-E	Use of Emergency Diesel Generator

Cutter Allocation

WHEC 378
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB

Manpower Allocation

4 in Engineering

Package "C" Gas Turbine Propulsion

Z Number	Title
Z-25-E	Locking and Unlocking Shaft Underway
Z-27-E	Hot Bearing
Z-29-E	High Oil Level in Main Reduction Gear Casing
Z-45-E	Icing at the Turbine Air Inlet
Z-46-E	Excessive Turbine Vibration
Z-47-E	Lube Oil Overhearing
Z-48-E	Loss of Fire in Combustion Chamber With Rapid Decrease in Tt7 Temperature
Z-49-E	Loss of Lube Oil Pressure
Z-50-E	Turbine Fails to Start
Z-51-E	High Exhaust Gas Temperature
Z-52-E	Turbine Fails to Come Up to Idle Speed
Z-53-E	Class "B" Fire Inside Casing
Z-80-E	Synchronizing Alternators or Paralleling Generators
Z-81-E	Generator Overloads
Z-82-E	Cutting Out Generator in an Emergency

Cutter Allocation

WHEC 378

Manpower Allocation

4 in Engineering

ANTISUBMARINE WARFARE EXERCISES (WHEC-378)

Pages C-63 through C-67 have been allocated for publication of Operational descriptions of ASW Exercises that are amenable to simulation should such documentation be required. However, since this information is classified, it has been excluded from publication herein.

For information purposes, the appropriate ASW Exercise numbers from FXP-1 are listed below:

J-2-U	Z-9-U	W-5-U	W-52-UL
J-3-U	Z-16-U	W-7-U	W-53-UL
Z-1-U	Z-17-U	W-8-U	
Z-4-U	Z-18-U	W-50-UL	
Z-6-U	Z-23-U	W-51-U	

9. Z-11-EW ESM Detection, Analysis and Reporting

Purpose: Train ESM operators in detecting, analyzing, identifying, direction finding, reporting and tracking of electronic signals.

Related: COMLANTAREA OPLAN 1-(FY)
CG415-2 LPO's: 0-141 ECM
0-237 Radio Direction Finding Procedures
0-132 Radio Direction Finder

STD Curriculum: Electronic Warfare-scheduled for all Hamilton Class WHEC's

Associated Equipments (Typical WHEC)

Direction Finder Set, WLR-1

Evaluation:

1. Equipment type
2. Antennas used
3. Antenna system, calibration, arrangement

Cutter Allocation

WHEC 378

Manpower Allocation

CIC/EW, Elect., 3 Enlisted

C2.1 OPERATIONAL TRAINING NOT ANALYZED FOR USCG TRAINING

The following 35 exercises were not considered likely candidates for training in the simulator. These areas--Fire Fighting and Damage Control--should be considered for expanded training using new expensive, environmentally safe simulators under development by the Navy. In addition, there is deck procedural training requiring actual "hands-on" usage of equipment for effective training that should be continued in on-the-job training.

63. Z-6-ET <u>Combatting Class "C" Fires</u>

Purpose: Train personnel to report, control and extinguish Class "C" fires.

Related: CG415-2 LPO's: 0-329 Combatting Class "C" Fires
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

CO_2 Fire Extinguisher, shorting probe

<u>Evaluation</u>:

1. Power secured
2. Ventilation secured
3. Initial reports
4. CO2 cylinder
5. Investigation of damage
6. Follow-up reports

<u>Cutter Allocation</u>

All

64. Z-7-ET <u>Equipment Casualty Repair</u>

Purpose: Train technicians to handle equipment casualties under battle conditions.

Related: CG415-2 LPO's: None

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

Evaluation:

1. Reports
2. Investigation
3. Use of Standby equipment
4. Availability and use of equipment
5. Effected repairs

<u>Cutter Allocation</u>

All

1. Z-6-V Aircraft Crash and Fire

Purpose: Train ships personnel in the rescue of the crew and extinguishing a fire.

Related: Chapter 9; Salvage, and Chapter 10; Aircraft Firefighting of CG-419 Shipboard-Helicopter Operational Procedures

CG 260-8 Operational Bills 3204; Helicopter Crash and Rescue Bill

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

1. Salvage equipment, per paragraph 904 and 904.1 of CG-419, such as bridles, cables, harnesses, hoists, shackles, hand tools, etc.
2. Fire fighting equipment per paragraph 1020 of CG-419 such as fire hose, nozzles, fog applicator, protein foam, CO_2 and PKP.

Evaluation:

1. Effective preparation and organization for the exercise.
2. Personnel proficient in aircraft fire fighting procedures showing a high state of training and team work.
3. Rescue procedures.
4. Personnel proficient in first aid and self aid.
5. Personnel proficient in crash and salvage.
6. Safety precautions observed during exercise.

Cutter Allocation

WMEC 210

27. Z-24-D Underwater Hull Damage

Purpose: Train repair party personnel in determining extent of flooding and in dewatering flooded areas and effecting emergency repairs.

Related: CG415-4 LPO's: DC-013 Patching and Plugging the Hull

DC-014 Principles of Shoring

DC-016 Dewatering and Drainage Systems

DC-006 Damage Control Systems

DC-007 Boundaries, Fire and Flooding

DC-008 System Isolation

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Units damage control plates, plugging material

Evaluation:

Phase 1:
1. Action of investigating party in determining the extent and source of flooding.
2. Action of repair party in determining and establishing effective flooding boundaries.
3. Proper dissemination of information and reports.
4. Action of repair party in controlling flooding and dewatering affected areas.

Phase 2:
1. Proper sounding of alarm.
2. Speed of repair party in reporting to the scene.
3. Speed of duty repair party in establishing and maintaining flooding boundaries.
4. Use of proper procedures.
5. Completeness of reports.

Cutter Allocation

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

28. Z-27-D Fire Extinguishing and Smoke Clearance

Purpose: Train repair party personnel in fire extinguishing and smoke clearance.

Related: CG415-4 LPO's: E-024 Combating a Bilge Fire

DC-018 Introduction to Fire Fighting Procedures

DC-019 Fire Fighting Procedures

CG415-2 LPO's: 0-329 Combating Class "C" Fires

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

CO_2 portable extinguishers, foam, water fog
Suction hoses and strainers, fire hoses and nozzles

Evaluation:

1. Proper dissemination of information and reports.
2. Action of on-scene personnel in discovering the fire.
3. Action of fire party.
4. Variation from type standard in speed of fire party.

Cutter Allocation

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

29. Z-33-D <u>Salvage and Demolition</u>

Purpose: Train own ships salvage and demolition parties.

Related: CG415 LPO's: None
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation:</u>

1. Proper dissemination of information and reports.
2. Ability of salvage party to man and operate vital stations.
3. Action of salvage party in controlling damage and preparing ship to get underway or proper procedures for destroying the ship.

<u>Cutter Allocation</u>

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295

30. Z-34-D Righting Ship

Purpose: Train damage control organization in correcting a list.

Related: CG415 LPO's: .None
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Proper dissemination of information and reports.
2. Action of repair party in determining the extent of flooding and liquid loading at start of problem.
3. Ability of damage control personnel to compute effect of damage and to determine means of counterflooding or shifting of the liquid load to correct list or trim.
4. Simulated action of repair party in counterflooding.

Cutter Allocation

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295

67. Z-10-ET <u>Use of Installed Spare Fuses</u>

Purpose: Train personnel to use spare fuses to repair casualties.

Related: CG415 LPO's: None
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation</u>:

1. Found blown fuse
2. Spare in holder provided
3. Replaced blown fuse
4. Use of manual
5. Reports

<u>Cutter Allocation</u>

All

21. Z-21-C Flashing Light Procedures

Purpose: Train and evaluate signal bridge personnel in the use of directional/non-directional flashing light.

Related: CG415-2 LPO's: 0-023 Signaling Equipment

0-045 Signaling with NANCY Gear

0-051 Flashing Light Procedure (International)

0-052 Flashing Light Procedure (Navy)

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment (Typical WHEC)

Infrared Viewing Set AN/SAR-7
Transmitter. Set Infrared AN/SAT-2
12" Signal Searchlight

Evaluation:

None listed.

Cutter Allocation

WMEC 210
WHEC
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

Manpower Allocation

2 Enlisted

59. Z-2-ET Investigation and Reporting

Purpose: Train personnel in conducting a thorough investigation for damage after any incident

Related: CG415 LPO's: None
Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Action to minimize damage
2. Sound power and IC check
3. Equipment in use checked
4. Equipment in standby checked
5. Spacea investigated
6. Reports

Cutter Allocation

All

60. Z-3-ET <u>Report of Electronic Casualties</u>

Purpose: Train personnel in proper procedures for reporting equipment and personnel casualties.

Related: CG415-2 LPO's: 0-326 EICAM Reporting
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation</u>:

1. Report nature of casualty to ECC
2. Identify type of equipment or name of personnel involved.
3. Request assistance as required and notify proper personnel.
4. Progress reports to proper personnel.
5. Estimate time of repair
6. Completion of repairs to ECC
7. Completion of repairs to parties concerned.

<u>Cutter Allocation</u>

All

61. Z-4-ET <u>Assistance to Remote Spaces</u>

Purpose: Train personnel to provide technical assistance to remote stations where a technician is not stationed.

Related: CG415-2 LPO's: None

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation:</u>

1. ECC sent assistance
2. Use of DC routes and fittings
3. Availability of tools, test equipment and manuals
4. Familiarity of spaces and equipment
5. Effectiveness of assistance
6. Reports

<u>Cutter Allocation</u>

All

62. Z-5-ET **First Aid for Electric Shock**

Purpose: Train personnel to administer first aid for electric shock.

Related: CG415-2 LPO's: 0-300 SAFETY: Artificial Respiration and Resuscitation

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Initial action
2. Post-breathing
3. Initial report with name and rate
4. Follow-up reports

Cutter Allocation

All

48. Z-14-S <u>Preparations for Abandon Ship</u>

Purpose: Train personnel in abandoning ship (without debarking).

Related: CG260-7 Emergency Bill 3302; Abandon Ship Bill
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation</u>:

1. Adequacy of abandon ship bill and organization of salvage and demolition parties.
2. Personnel performance.
3. Adequacy of abandon ship equipment.

<u>Cutter Allocation</u>

WHEC 378
WHEC (255, 327)
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

20. Z-20-C <u>Flaghoist Signaling Procedures</u>

Purpose: Train and evaluate the tactical communications team in flaghoist signaling procedures.

Related: CG415-2 LPO's: 0-050 Flag Hoist

0-136 ATP I, Vol II

CG415-3 LPO's: D-010 Visual Communications

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation:</u>

1. Personal knowledge
2. Personnel performance
3. Reliability

<u>Cutter Allocation</u>

WMEC 210
WHEC
WMEC (Tugs & WAGO 167)
WLB
WAGB
WAGO 295
WPB
WYTM
WLM

22. Z-22-C Semaphore

Purpose: Train and evaluate communication personnel in use of semaphore

Related: CG415-2 LPO's: 0-048 Semaphore Procedure

0-049 International Code of Signals

0-053 Message Construction

0-054 Collective Calls, Visual

0-055 Communication Procedure - Visual

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Personnel performance

Cutter Allocation

WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WLM

24. Z-41-C <u>Emergency Destruction</u>

Purpose: Train and evaluate personnel in emergency destruction of classified communications equipment and material.

Related: CG415-2 LPO's: 0-208 Emergency Destruction Bill Instructions

CG415-3 LPO's: D-029 Emergency Destruction of Classified Material

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation:</u>

Did exercise meet requirements set forth in RPS4 and KAG1?
Were personnel cognizant of responsibilities and specific functions?
Was complete destruction completed in timely manner?

<u>Cutter Allocation</u>

WMEC 210
WHEC
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WPB

26. Z-12-D <u>Darken Ship</u>

Purpose: Train personnel in darken-ship procedures.

Related: CG415-2 LPO's:. None

CG260-7 Non-Combat Operational Bills 5509; Darken Ship
COMLANTAREA OPLAN 1-(FY)
Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

Evaluation:

1. Darken ship fittings correctly labeled
2. Damage control checkoff list correct
3. Effectiveness of darken ship
4. Appropriate equipment in state of readiness
5. Variation from type standard in completing darken ship.

<u>Cutter Allocation</u>

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WPB

31. Z-54-D Biological/Chemical Attack

Purpose: Train personnel in proper procedures in event of biological/chemical attack.

Related: CG415 LPO's: None

CG260-7 Non-Combat Operational Bills 3303; Nuclear, Biological and Chemical Warfare

COMLANTAREA OPLAN 1-(FY)

Proficiency Cruising CAAINST 3500.2A

Associated Equipment:

Evaluation:

1. Performance in preparatory phase.
2. Performance in defensive countermeasures phase.
3. Performance in recovery phase.

Cutter Allocation

WHEC
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGO 295
WPB
WYTM
WLM
WLI
WLIC

68. Z-11-ET <u>Use of Casualty Control Folder</u>

<u>Purpose: Train personnel in use of casualty control folder.</u>

Related: CG415 LPO's: None

Proficiency Cruising CAAINST 3500.2A

<u>Associated Equipment</u>

<u>Evaluation</u>:

1. Completeness and availability
2. Use of casualty control folder

<u>Cutter Allocation</u>:

All

69. Z-12-ET <u>Drawing Emergency Spare Parts</u>

Purpose: Train personnel in procedure for drawing emergency repair parts in coordination with Damage Control Central and Supply Department.

Related: CG415-2 LPO's: 0-330 Drawing Emergency Repair Parts when at GQ

Proficiency Cruising CAAINST 3500.2A

Associated Equipment

Evaluation:

1. Effective use of IC
2. Permission and use of fittings
3. Correct part to space
4. Reports

Cutter Allocation

All

75. Z-18-ET Cleaning Procedures for Broken Radio-Active Tubes

Purpose: Train in correct cleanup procedures for broken radio-active tubes.

Related: CG415 LPO's

Associated Equipment

Evaluation:

1. Reports
2. Decontamination procedures
3. Disposal procedure
4. Safety
5. Self-aid procedures

Cutter Allocation

All

Package "D" Damage Control

Z Number	Title
Z-1-D	Locating Damage Control Fittings
Z-4-D	Relief of Vital Stations
Z-10-D	Setting Material Condition
Z-11-D	Manning Battle Stations
Z-20-D	Emergency Interior Communications
Z-24-D	Underwater Hull Damage
Z-25-D	Shoring
Z-26-D	Topside Damage
Z-27-D	Fire Extinguishing and Smoke Clearance
Z-29-D	Isolating and Patching Damage Piping
Z-32-D	Hit in Machinery Space
Z-52-D	Nuclear Detonation

Cutter Allocation

WHEC 378
WHEC (255,327)
WMEC 210
WMEC (Tugs & WAGO 167)
WLB
WAGB

C2.1.1 Establish Ships Equipment

In order to establish the ship equipment presently in use to provide the hardware for the potential simulators, a computer run-off of the total inventory was reviewed to come up with the "typical" equipment to use for the simulator mockup departments.

The first step was to evaluate the total equipments for the 278 large cutters in use. Table C-1 is a summary of this analysis listing the number of equipment types and the number of positions where these types of equipment are used. Table C-2 is the equipment list made from the computer runoff and used to generate the summary.

Figure C-2 provides some of the detail of this summary by ship departments. ADC decided that as a result of the wide variation in equipment types a "universal" ship simulator could not be economically configured. The ship simulator would have to be looked at in individual ship types.

TABLE C-1. SUMMARY OF RADAR, SONAR, DF, NAVAIDS AND ASW EQUIPMENT

Number of cutters interrogated 278

RADAR	Equipment Types	Positions
Radar Surface Search	23	266
Recognition Set Radar	2	30
Radar Indicators	7	50
Indicator Group	3	21
Interrogator Set Radar	1	1
Indicator Azimuth-Range	4	20
Indicator Azimuth	1	2
Indicator Range	1	5
Radar CCS-CA-MK-74	1	1
Radar Set Air-Surface	1	6
Radar Set Fire Control	2	9
Control Radar	2	40
Transponder Set Radar	5	107
	53 Radar Types	

SONAR		
Sonar Set Sounding	15	316
Sonar Set Ranging	2	8
Indicator Digital Depth	1	1
Communications Set Sonar	1	10
Indicator Sonar	1	6
Control Sonar	1	2
Target Designator Sonar	1	1
	22 Sonar Types	

TABLE C-1 (continued)

	Equipment Types
DF EQUIPMENT	
Direction Finder Set	9
Direction Finder	3
Direction Finder Automatic	1
	13 DF Types
LORAN	
Receiving Set Loran	4
Receiver Loran-C	4
Receiver Low Cost Lor-C	1
Receiver Loran A-C	1
OMEGA	
Receiver Omega	1
NAV RADIO	
Receiver Radio Nav	1
ASW	
ASW Plotter	1

TABLE C-2. EQUIPMENT LIST

RADAR SURFACE SEARCH — 23 Types

Positions

109
95
2
204
16
7
1
6
7
10

AN/SPS-53	26
AN/SPS-53A	6
AN/SPS-53B	33
AN/SPS-53C	28
AN/SPS-53H	4
AN/SPS-53K	15
AN/SPS-53M	46
AN/SPS-51	5
AN/SPS-51A	26
AN/SPS-23	3
AN/SPS-23A	2
AN/SPS-23XX	1
AN/SPS-23Y	1
AN/SPN-11	2
AN/SPN-11X	32
AN/SPS-10B	3
AN/SPS-57X	1
AN/SPS-57	3
CZL-MR-5	3
CZL-MR-4	1
CZL-MR-4W	1
CZL-MR-3AW	1
CCXT-RM-914	1
CCXT-T-219	22
	266 positions

TABLE C-2 (continued)

RECOGNITION SET RADAR		2 Types
AN/UPX-1	25	
AN/UPX-1A	5	
	30 positions	
RADAR INDICATOR		7 Types
AN/SPA-66	25	
ID-1262A/SPS-51	2	
ID-445/SPS	3	
IP-452/SPS	7	
IP-306/SPS	3	
IP-307/SPS	4	
ID-444/SPS	6	
	50 positions	
INDICATOR GROUP		3 Types
AN/SPA-25	4	
AN/SPA-25A	13	
AN/SPA-25B	4	
	21 positions	
INTERROGATOR SET RADAR		1 Type
AN/UPX-11	1 position	
INDICATOR AZIMUTH-RANGE		4 Types
IP-681A/SPS-51	11	
IP-681/SPS-51	2	
IP-681A/SPS-51MD	5	
AN/SPA-4A	2	
	20 positions	

TABLE C-2 (continued)

INDICATOR AZIMUTH		1 Type
ID-1262/SPS-51A	2 positions	
INDICATOR RANGE		1 Type
AN/SPA-34	5 positions	
RADAR		1 Type
CS-CA-MK-74	1 position	
RADAR SET AIR-SURFACE		1 Type
AN/SPS-6C	6 positions	
RADAR SET FIRE CONTROL		2 Types
MK26M4 Radar	6	
MK26M3	3	
	9 positions	
CONTROL RADAR		2 Types
C-1407/UPA-38	12	
C-1406A/UPA-38	28	
	40 positions	
TRANSPONDER SET RADAR		5 Types
AN/UPX-12	11	
AN/UPX-12A	1	
AN/UPX-12B	12	
AN/UPX-17	82	
AN/UPX-17C	1	
	107 positions	

TABLE C-2 (continued)

SONAR

SONAR SET SOUNDING		15 Types
AN/UQN-1	1	
AN/UQN-1C	34	
AN/UQN-1D	12	
AN/UQN-1G	1	
AN/UQN-1W	26	
AN/UQN-1F	4	
AN/UQN-4	27	
AN/SQN-13	180	
AN/SQN-13X	1	
AN/SQN-1B	2	
CRP-DE-721A	1	
CRD-DE-121A	1	
CZL-DI-9	1	
CZL-DR-17	23	
CM-DI-6	2	
	316 positions	
SONAR SET RANGING		2 Types
AN/SQS-38:12	4	
CDPS-CG-300	4	
	8 positions	
INDICATOR DIGITAL DEPTH		1 Type
ID-1566/UQN-4	1 position	

TABLE C-2 (continued)

COMMUNICATIONS SET SONAR	1 Type
AN/WQC-2	10 positions
INDICATOR SONAR	1 Type
ID-1244/SQN-13	6 positions
CONTROL SONAR	1 Type
C-7441/WQC-2	2 positions
TARGET DESIGNATOR SONAR	1 Type
MK8M3	1 position

TABLE C-2 (continued)

RECEIVING SET LORAN	4 types	
AN/UPN-23	70	
AN/SPN-25	112	
AN/SPN-45	20	
CDDA-DX-NAV	2	
	204 positions	
RECEIVER LORAN-C	4 types	
CDUW-TDL-601	6	
CDUW-TDL-601A	2	
CCXT-DL-91	7	
CDDO-4010	1	
	16 positions	
RECEIVER LOW COST LOR-C	1 type	
CDUP-101	7 positions	
RECEIVER LORAN A-C	1 type	
CCST-8950-ADL-21	1 position	
OMEGA	1 type	
AN/SRN-12 Receiver Omega	6 positions	
NAV RADIO	1 type	
AN/SRN-9 Receiver Radio Nav	7 positions	

TABLE C-2 (continued)

DIRECTION FINDER SET		9 Types
AN/URD-4	9	
AN/URD-4A	2	
AN/URD-4D	10	
AN/SRD-12	56	
AN/SRD-13	23	
CRP-355R	6	
GCF-RDSC-121	1	
CRM-AR-8712	1	
CM-ADF-162	1	
	109 positions	

DIRECTION FINDER		3 Types
CZL-ADF-100	18	
CZL-ADF-100-T	69	
CZL-100	8	
	95 positions	

DIRECTION FINDER AUTOMATIC		1 Type
CDNM-PS-100R	2 positions	

ASW

ASW Plotter		1 Type
MK-NL-2 MOD 2A	10 positions	

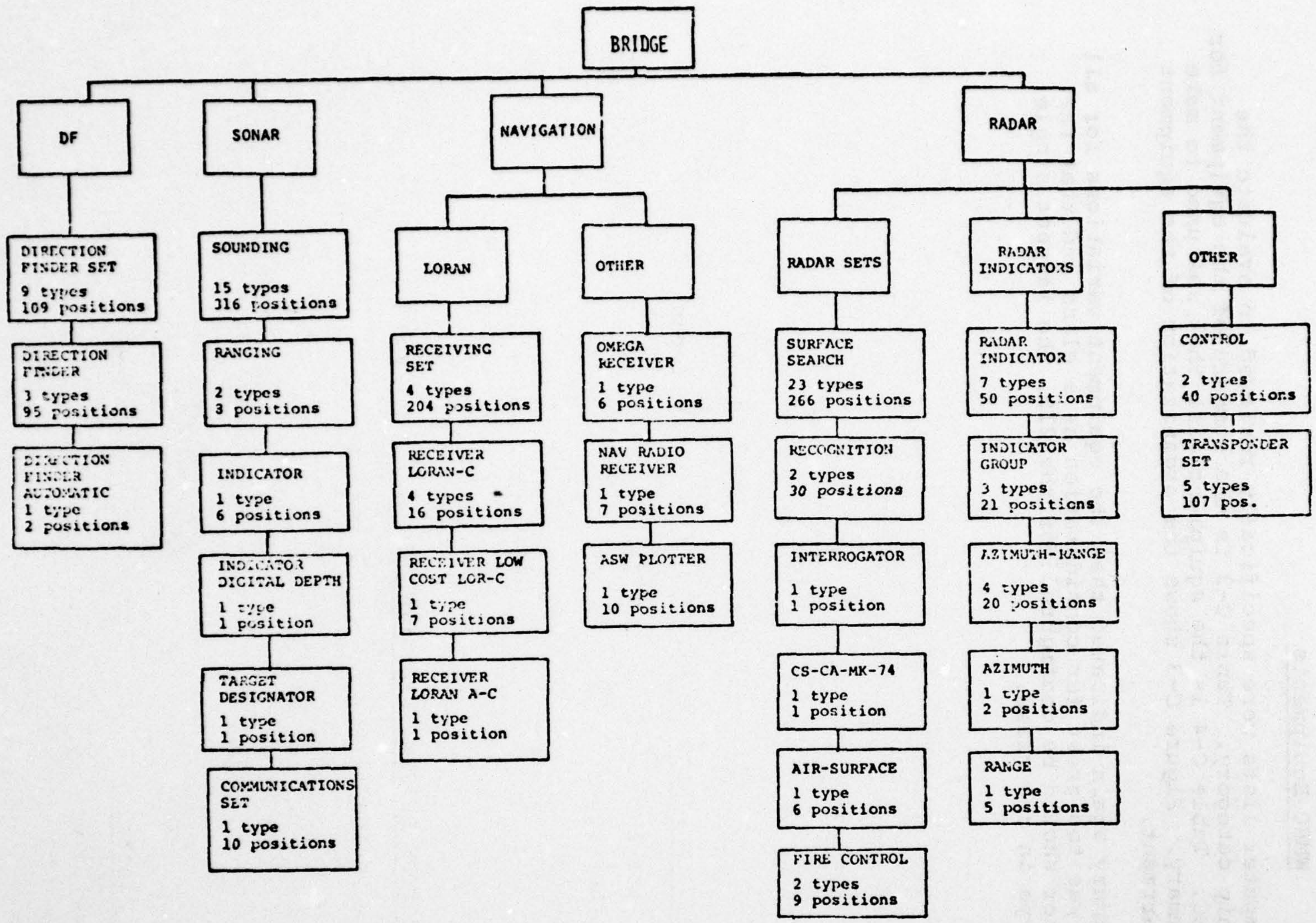

FIGURE C-2. SUMMARY OF 278 LARGE CUTTER EQUIPMENT

C2.1.2 WMEC Equipments

The computer lists were specifically reviewed to evaluate the WMEC ship category. Table C-3 is the summary of the equipment for the WMEC. Table C-4 is the equipment list that was used to make the summary. Figure C-3 shows the organization of the equipment by department.

The summary again indicated that the equipment variations for all WMEC's was too great for consideration as a class and that the simulator should be configured for the 210, the largest single ship type in the class.

TABLE C-3. WMEC SUMMARY

RADAR	Equipment Types	Positions
Radar Surface Search	7	25
Indicator Radar	1	1
Indicator Azimuth	1	2
Indicator Azimuth - Range	3	12
Indicator Group	2	2
Radar Set	1	1
Control Radar	2	13
Transponder Set Radar	2	21
	19	
SONAR		
Sonar Set Sounding	7	37
Indicator Sonar	1	1
	8	
DF EQUIPMENT		
Direction Finder Set	2	8
Direction Finder	1	13
	3	
LORAN		
Receiving Set Loran	4	24
Receiver Low Cost Lor-C	1	1
Receiver Loran-C	2	6
Loran-C Receiver	1	1
	8	
INFRARED		
Infrared Receiver	3	5
Infrared Viewing Set	4	18
Transmitter Set Infrared	2	17
Infrared Visor	1	1
	10	

TABLE C-3 (continued)

RADIO	Equipment Types	Positions
Radio Set Portable	4	25
Radio Set	3	25
Radio Set SSB	1	19
Radio Set FM	1	9
Receiver Radio	20	69
Receiving Set Radio	9	49
Receiver-Transmitter	2	5
Transceiver SSB HF	2	18
Transceiver VHF-FM	1	2
Transceiver VHF-FM Porta	2	23
Transceiver MR-201	1	1
Transmitting Set Radio	5	22
Transmitter Radio	4	18
Control Radio Set	6	50
Control Radio	3	29
Control Transmitter TTY	2	13
Control Radio Auxiliary	1	1
	67	
TELETYPE		
Teletypewriter	5	31
Teletypewriter Set	2	12
	7	
INFRARED RECEIVER		
AM	2	
C-3	2	
C-3A	1	

TABLE C-4. EQUIPMENT LIST

INFRARED VIEWING SET	
AN/SAR-4B	1
AN/SAR-7	3
AN/SAR-7A	1
AN/SAR-4	13
INFRARED VISOR	
H	1
TRANSMITTER SET INFRARED	
AN/SAT-2	15
AN/SAT-2A	2
RADIO SET PORTABLE	
AN/CRT-3A	3
AN/CRT-3	14
AN/PRC-59	4
AN/URC-4	4
RADIO SET	
AN/URC-45	5
AN/URC-9	19
AN/PRC-108	1
RADIO SET SSB	
AN/URC-51	19
RADIO SET FM	
AN/URC-80V1	9

TABLE C-4 (continued)

RECEIVER RADIO	
R-1051D/URR	9
R-1051B/URR	14
R-390A/URR	16
R-172A/UX	1
R-5007A/FRR-502	5
R-1051E/URR	4
CHL-SX-130	3
CHL-SX-133	1
CHL-SX-210	1
CHL-SX-110-X	5
R-1051/URR	1
R-5007/FRR-502	1
CFG-220-T	1
CHL-SX-110-K	1
R-389/URR	1
R-390/URR	1
R-649/URR	1
R-841/URR	1
RBA-3	1
CHC-HQ-180-AXR	1
RECEIVING SET RADIO	
AN/FRR-49V	1
AN/URR-35C	9
AN/WRR-3	8
AN/WRR-3B	9
AN/URR-35A	2
AN/URR-44	1
AN/WRR-3A	9
AN/URR-13A	7
AN/URR-35	3
RECEIVER-TRANSMITTER	
RT-790/URC-58	4
COL-618T-2	1

TABLE C-4 (continued)

TRANSCEIVER SSB HF	
AN/URC-58V	7
AN/URC-58	11
TRANSCEIVER VHF-FM	
CGG-D3ABA1625AK	2
TRANSCEIVER VHF-FM PORTA	
CCI-802	1
CCI-802M	22
TRANSCEIVER MR-201	
COL-718V-1B	1
TRANSMITTING SET RADIO	
AN/URT-12	2
AN/URT-20	12
AN/URT-13	2
AN/SRT-21	2
AN/URT-20A	4
TRANSMITTER RADIO	
TDE-1	1
TED-9	1
T-827D/URT	3
T-827B/URT	13
CONTROL RADIO SET	
C-6282B/U	4
C-1138/UR	3
C-1138B/UR	19
C-6282A/U	6
C-1138A/UR	4
C-6282/U	14

TABLE C-4 (continued)

CONTROL RADIO	
C-2383/URC-9	15
C-4374/URC-45	6
C-8006/URC-58	8
CONTROL TRANSMITTER TTY	
C-1004/SG	2
C-1004B/SG	11
CONTROL RADIO AUXILIARY	
C-4373/URC-45	1
TELETYPEWRITER	
CTT-28-RO	4
CTT-28-ASR-AUX	19
CTT-28-ASR	3
CTT-28-KSR	4
TT-176A/UG	1
TELETYPEWRITER SET	
AN/UGC-25A	8
AN/UGC-6K	4
RADAR SET SURFACE SEARCH	
AN/SPS-53K	14
AN/SPS-51A	1
AN/SPS-23XX	1
AN/SPS-53M	5
AN/SPS-53H	1
AN/SPS-53	2
AN/SPS-53A	1
INDICATOR RADAR	
ID-444/SPS	1

TABLE C-4 (continued)

INDICATOR AZIMUTH	
ID-1262/SPS-51A	1
INDICATOR AZIMUTH-RANGE	
IP-681A/SPS-51MD	5
IP-681/SPS-51	1
IP-681A/SPS-51	6
INDICATOR GROUP	
AN/SPA-25A	1
AN/SPA-25	1
RADAR SET	
AN/SPS-57	1
CONTROL RADAR	
C-1407A/UPA-38	3
C-1407/UPA-38	10
TRANSPONDER SET RADAR	
AN/UPX-17	20
AN/UPX-12B	1
RECEIVING SET LORAN	
CDDA-DX-NAV	1
AN/UPN-23	8
AN/SPN-45	1
AN/SPN-25	14
RECEIVER LOW COST LOR-C	
CDUP-101	1
RECEIVER LORAN-C	
CDUW-TDL-601	4
CDUW-TDL-601A	2
LORAN-C RECEIVER	
CDDO-4010	1

TABLE C-4 (continued)

SONAR SET SOUNDING	
AN/SQN-13	14
AN/UQN-1F	2
AN/UQN-1H	10
AN/UQN-1C	5
CZL-DR-17	1
AN/UQN-1D	3
AN/UQN-1B	2
INDICATOR SONAR	
ID-1244/SQN-13	1
DIRECTION FINDER SET	
AN/SRD-12	4
AN/SRD-13	4
DIRECTION FINDER	
CZL-ADF-100-T	13

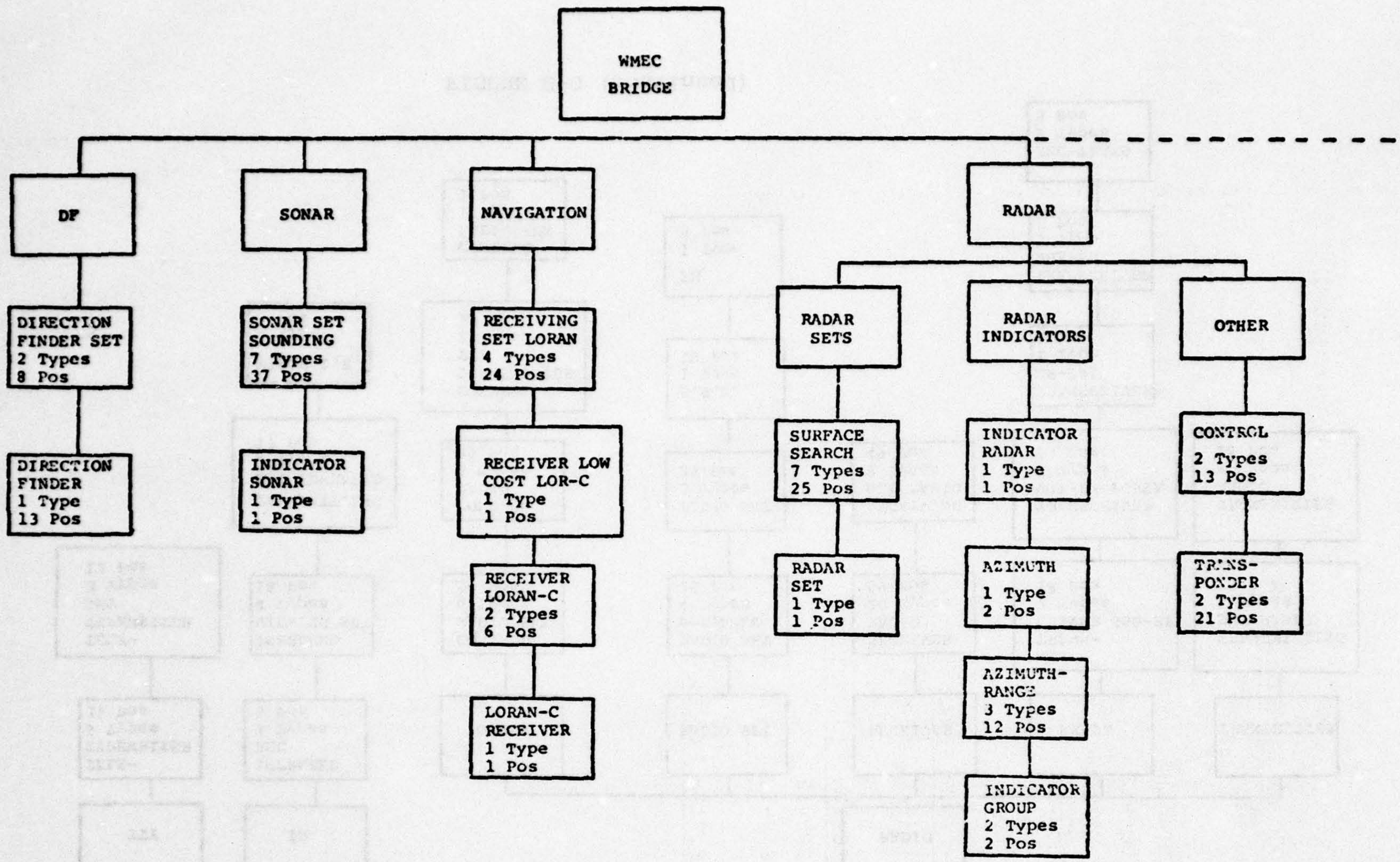

FIGURE C-3. WMEC SUMMARY

WMEC BRIDGE - Continued

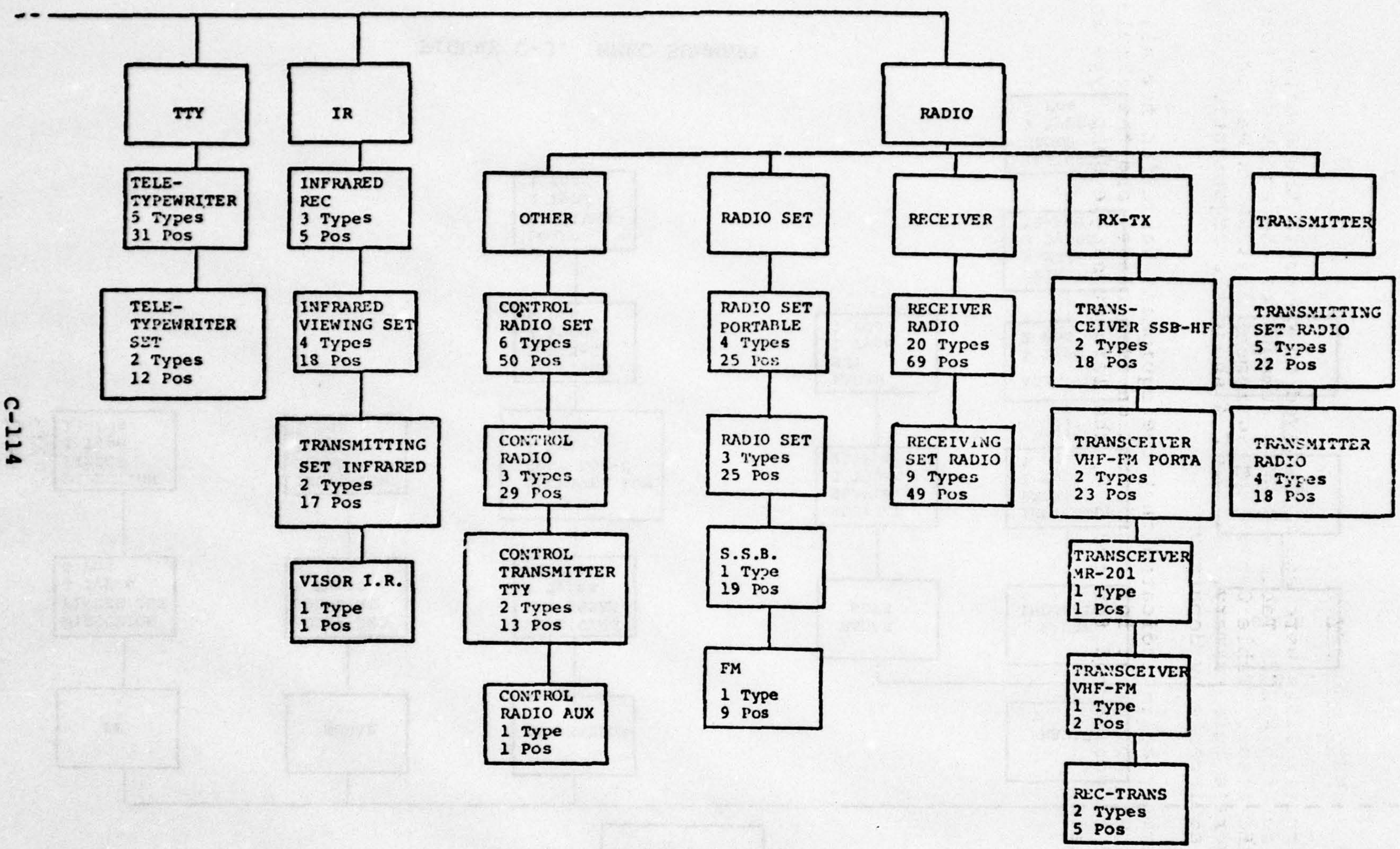

FIGURE C-3 (continued)

C2.1.3 WHEC Summary

The computer lists were again reviewed to generate the equipment types for the WHEC. Table C-5 is a summary of the equipment for the WHEC class. Table C-6 is the equipment list which was used to generate this summary. Figure C-4 shows the organization of these equipments by department.

The summary again indicated that the equipment variation for all WHEC's was too great for consideration as a class, and the simulator should be configured for the 378, the largest single ship type in the class.

TABLE C-5 WHEC SUMMARY

RADAR	Equipment Types	Positions
Radar Surface Search	2	16
Recognition Set Radar	1	14
Indicator Azimuth-Range	1	4
Indicator Group	4	29
Indicator Radar	1	2
Control Radar	1	4
Radar Set Fire Control	1	1
Transponder Set Radar	3	17
	14	
SONAR		
Sonar Set Sounding	4	30
Sonar Set	1	1
Communications Set Sonar	1	12
Depth Finder	1	1
	7	
DF EQUIPMENT		
Direction Finder Set	2	17
Direction Finder	1	16
	3	
LORAN		
Receiving Set Loran	4	29
Receiver Low Cost Lor-C	1	3
Receiver Loran A-C	1	1
Receiver Loran C	1	1
	7	
ASW		
ASW Plotter	1	11

TABLE C-5 (continued)

FACSIMILE	Equipment Types	Positions
Recorder Facsimile	1	5
INFRARED		
Infrared Receiver	3	7
Viewing Set Infrared	5	20
Transmitter Set Infrared	2	15
Infrared Visor	1	1
	11	
RADIO		
Radio Set Portable	4	25
Radio Set	6	41
Radio Set SSB	1	17
Receiving Set Radio	10	42
Receiver VHF Radio	1	15
Receiver Radio	7	34
Receiver	4	21
Radio Set FM	1	9
Receiving Set FLT SATCOM	1	2
Transceiver VHF-FM Porta	1	18
Transceiver MR-201	1	2
Transmitter Radio	1	17
Transmitter SSB HF	2	6
Receiver Communications	1	2
Receiver Transmitter	2	27
Transmitting Set	1	11
Transmitting Set Radio	2	18
Receiver Counter Measures	1	11
CM Receiving Set	1	7
Term Set Radio Teletype	1	17
Control Radio Set	8	57
Control Radio	4	29
Control Transmitter - TTY	1	2
	62	

TABLE C-5 (continued)

TELETYPE	Equipment Types	Positions
Teletypewriter Set	3	20
Teletypewriter	1	13
Terminal Telegraph	3	8
	7	

TABLE C-6. EQUIPMENT LIST

	POSITIONS PER TYPE
INFRARED RECEIVER	
AM	4
C-3	1
C-3A	2
VIEWING SET INFRARED	
AN/SAR-4	4
AN/SAR-4B	1
AN/SAR-6	1
AN/SAR-7	9
AN/SAR-7A	5
TRANSMITTER SET INFRARED	
AN/SAT-2	11
AN/SAT-2A	4
INFRARED VISOR	
H	1
RADIO SET PORTABLE	
AN/CRT-3	15
AN/CRT-3A	3
AN/PRC-59	1
AN/URC-4	6
RADIO SET	
AN/SRC-20	16
AN/SRC-21	17
AN/SCR-29	4
CACK-TR-226	2
CCZC-RF-301	1
AN/URC-9	1

TABLE C-6 (continued)

	POSITIONS PER TYPE
RADIO SET SSB	
AN/URC-51	17
RECEIVING SET RADIO	
AN/URR-22	4
AN/URR-27	1
AN/WRR-3B	13
AN/URR-27A	1
AN/URR-35A	7
AN/WRR-3	3
AN/URR-35C	5
AN/WRR-3A	4
AN/URR-35	3
AN/URR-35B	1
RECEIVER VHF RADIO	
R-1250/GR	15
RECEIVER RADIO	
COL-51S-1F	1
R-1051B/URR	12
R-390A/URR	13
CHL-SX-130	1
R1051D/URR	3
CHL-SX-210	1
R-1051E/URR	3
RECEIVER	
AN/SRR-19B	14
AN/SRR-19	4
R-1156/GR	2
AN/SRR-19A	1

TABLE C-6 (continued)

	POSITIONS PER TYPE
RADIO SET FM	
AN/URC-80V1	9
RECEIVING SET FLT SATCOM	
AN/SRR-1	2
TRANSCEIVER VHF-FM PORTA	
CCI-802M	18
TRANSCEIVER MR-201	
COL-178V-1B	2
TRANSMITTER RADIO	
T-827B/URT	17
TRANSCEIVER SSB HF	
AN/URC-58V	4
AN/URC-58	2
RECEIVER COMMUNICATIONS	
COL-651S-1	2
RECEIVER TRANSMITTER	
RT-1035/GR	17
RT-790/URC-58	10
TRANSMITTING SET	
AN/URT-20A	11
TRANSMITTING SET RADIO	
AN/URT-32	12
AN/URT-20	6

TABLE C-6 (continued)

	POSITIONS PER TYPE
RECEIVER COUNTERMEASURES	
AN/WLR-1C	11
CM RECEIVING SET	
AN/WLR-3	7
TERM SET RADIO TELETYPE	
AN/SGC-1A	17
TELETYPEWRITER SET	
AN/UGC-25A	17
AN/UGC-25	1
AN/UGC-6K	2
TELETYPEWRITER	
CTT-28-ASR-AUX	13
TERMINAL TELEGRAPH	
AN/UCC-1D	6
AN/UCC-1C	1
AN/UCC-1	1
CONTROL RADIO SET	
C-1138/UR	5
C-1138A/UR	3
C-1138B/UR	17
C-3868/SRC	10
C-6282B/U	1
C-6282A/U	13
C-6282/U	7
C-6756/SRC-29	1

TABLE C-6 (continued)

	POSITIONS PER TYPE
CONTROL RADIO	
C-4370/UR	17
C-8006/URC-58	8
C-3866/SRC	2
CCZC-RF-307	2
CONTROL TRANSMITTER-TTY	
C-1004/SG	2
RADAR SET SURFACE SEARCH	
AN/SPS-51A	13
AN/SPS-51	3
RECOGNITION SET RADAR	
AN/UPX-1	14
INDICATOR AZIMUTH-RANGE	
IP-681A/SPS-51	4
INDICATOR GROUP	
AN/SPA-66	17
AN/SPA-25A	7
AN/SPA-25B	3
AN/SPA-25	2
INDICATOR RADAR	
IP-452/SPS	2
TRANSPONDER SET RADAR	
AN/UPX-12	3
AN/UPX-12B	2
AN/UPX-17	12

TABLE C-6 (continued)

	POSITIONS PER TYPE
CONTROL RADAR	
C-1407/UPA-38	4
RADAR SET FIRE CONTROL	
MK26M4 Radar	1
RECEIVING SET LORAN	
AN/UPN-23	13
AN/SPN-25	4
AN/SPN-45	11
CCDA-DX-NAV	1
RECEIVER LOW COST LOR-C	
CDUP-101	3
RECEIVER LORAN A-C	
CCXT-8950-ADL-21	1
RECEIVER LORAN C	
CDUW-TDL-601	1
SONAR SET SOUNDING	
AN/UQN-4	15
AN/UQN-1H	2
AN/SQN-13	12
AN/UQN-1C	1
SONAR SET	
CCSF-66131	1
COMMUNICATIONS SET SONAR	
AN/WQC-2	12

TABLE C-6 (continued)

	POSITIONS PER TYPE
DIRECTION FINDER SET	
AN/URD-4	10
AN/URD-4D	7
DIRECTION FINDER	
CZL-ADF-100-T	16
DEPTH FINDER	
CAEG-T-202A	1
ASW PLOTTER	
MK-NC-2 MOD2A	11
RECORDER FACSIMILE	
RD-92A/UX	5

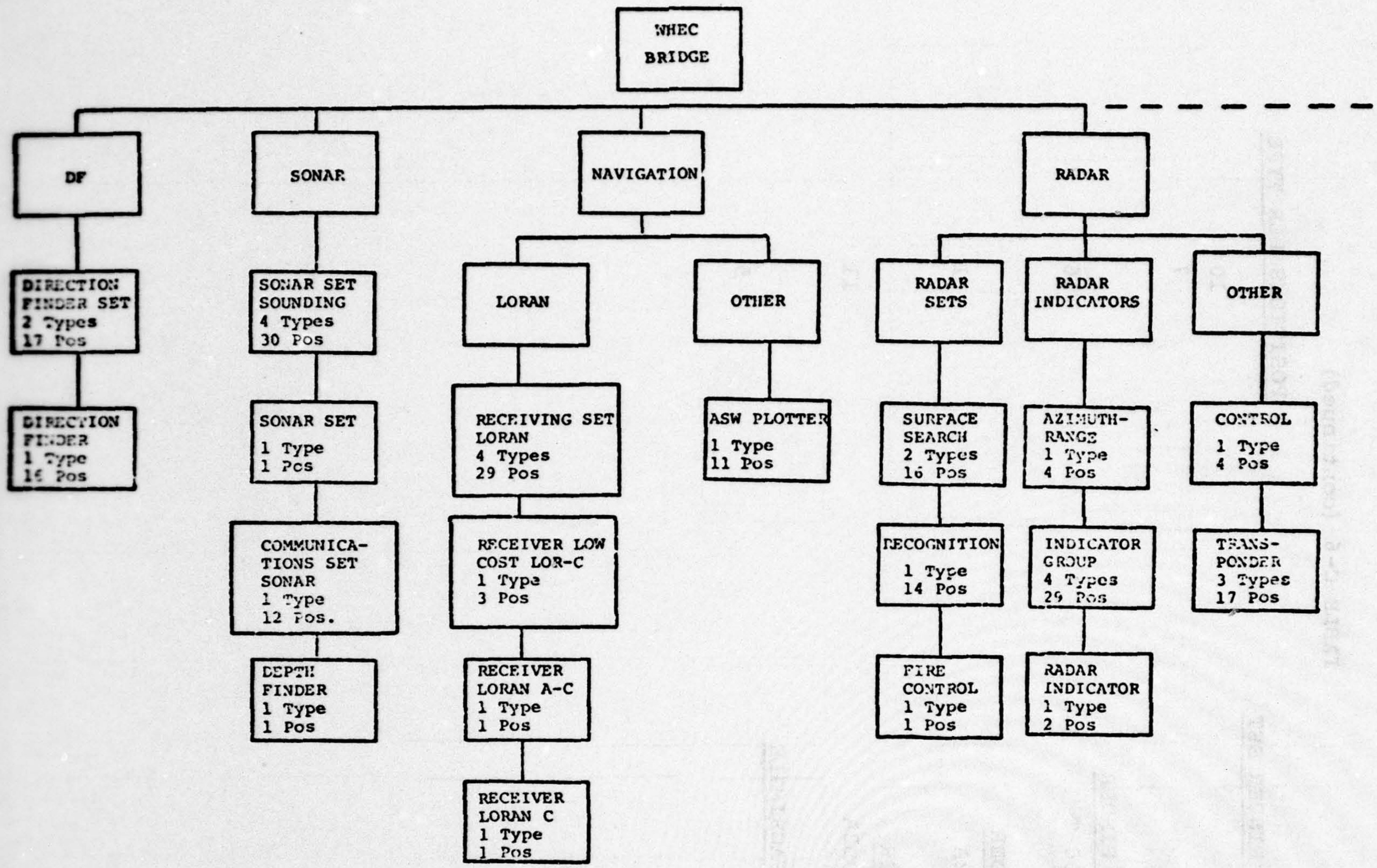

FIGURE C-4. WHEC SUMMARY

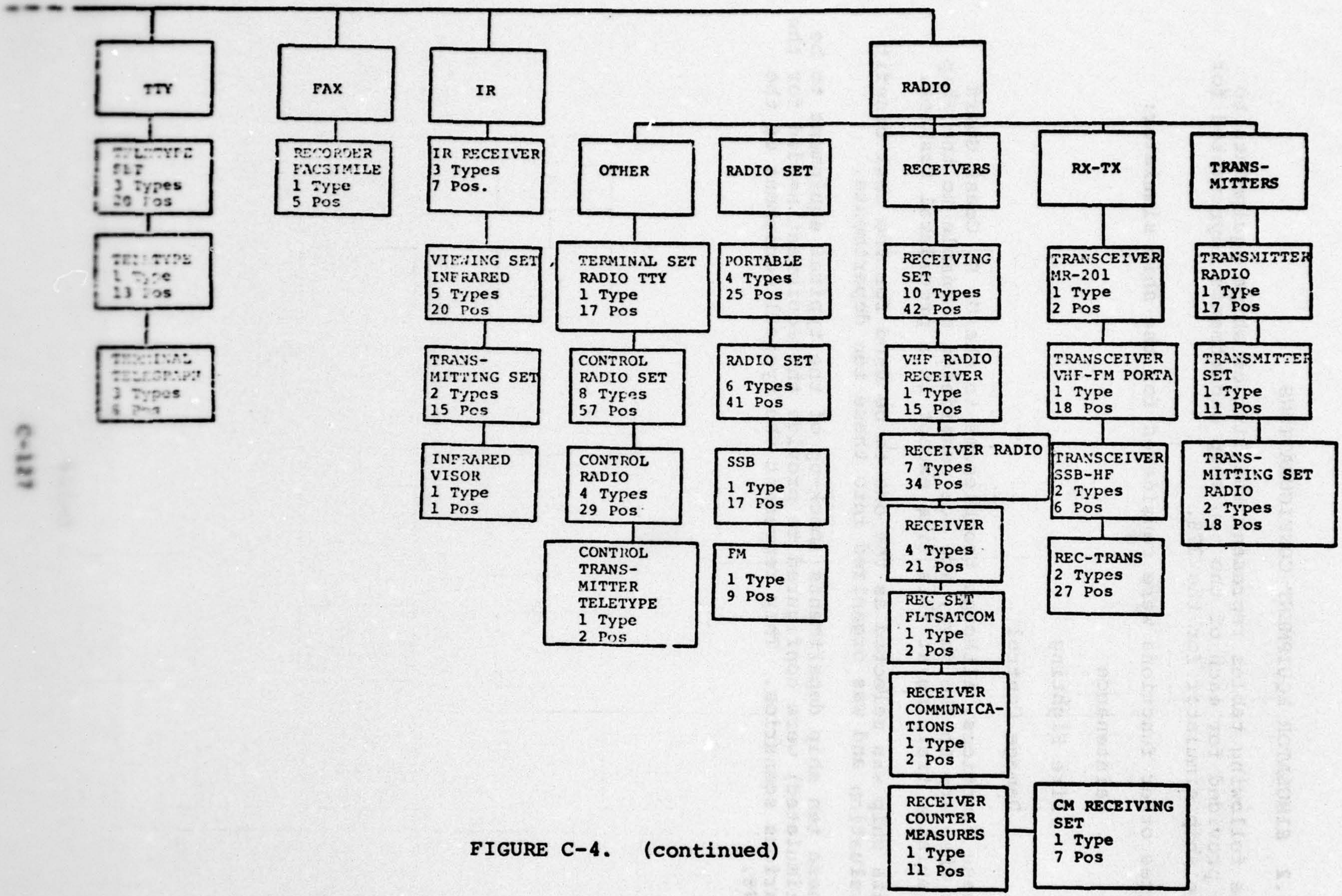

FIGURE C-4. (continued)

C2.2 SIMULATOR EQUIPMENT CONFIGURATIONS

The following tables represent the list of ships equipments to be provided for each of the ten ship departments represented for the ship simulator for the 378.

Three other functions were considered for the ship simulator:

Maintenance

Fire Fighting

Damage Control

These functions, although troublesome to the U. S. Coast Guard as they are to the Navy, are not considered amenable to the ship simulator training at this time except in a procedural fashion.

This ship was selected as the one to be used for the cost benefit evaluation and was organized into these ten departments.

These ten ship departments (mock-up of the typical equipment to be stimulated) were configured to provide the equipment needed for the various scenarios. They represent the typical equipment of the 378.

TABLE C-7. EQUIPMENT CONFIGURATION I LIST FOR 378 CIC SURFACE SEARCH

1. Fathometer
2. Gyrocompass
3. Speed Log
4. Radar Surface Search SPS-51
5. Indicator - SPA-66
6. Dead Reckoning Tracer MK-6 M4A
7. Dead Reckoning Analyzer DR14I
8. Maneuvering Board
9. Chart Table
10. Surface Summary Plot
11. Sound Powered Phone
12. Dial Telephone System 1C/TD-40G
13. Public Address System AN/PIC-2

TABLE C-8. EQUIPMENT CONFIGURATION II LIST FOR 378 CIC AIR SEARCH

1. IFF Radar Set AN/UPX-17
2. Air Search Radar AN/SPS-29
3. Recognition Set AN/UPX-1
4. Plotting Board
5. Tabulated Data Board

TABLE C-9. EQUIPMENT CONFIGURATION III LIST FOR 378 BRIDGE

1. Fathometer CAEG-T-202A
2. Magnetic Compass
3. Gyrocompass
4. Wind Speed and Direction
5. Radar Repeater
6. Engine Order Telegraph
7. Rudder Angle Indicator
8. Rate of Turn Indicator
9. Steering Stand
10. Sound Powered Phone
11. Dial Telephone System
12. VHF Radio

TABLE C-10. EQUIPMENT CONFIGURATION IV LIST FOR 378 COMMUNICATIONS

1. Transceiver SSB-HF AN/URC-58V
2. Receiver Transmitter RT-790/URC-58
3. Patch Panel SB-2744/SRT
4. Control Panels - C-1138B/UR
5. Patch Board SB-2727/SRR
6. AN/URC-51
7. R-390A/URR
8. Sound Powered Phone
9. Dial Telephone System
10. Telegraph AN/UCC-1D
11. Teletype AN/UGC-25A
12. Counter AN/USM-207
13. Receiver AN/WRR-3B
14. Control Radio Set C6282A/U
15. Receiver/Transmitter RT-1035/GR
16. Receiver R-1156/GR

AD-A056 766 APPLIED DIGITAL COMMUNICATIONS MOORESTOWN NJ F/G 13/10
A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY--ETC(U)
APR 77 D W HANNA, E W BOYLE, J F DESPANTZ DOT-CG-61814A
UNCLASSIFIED 3M080 USCG-C-1-77 NL

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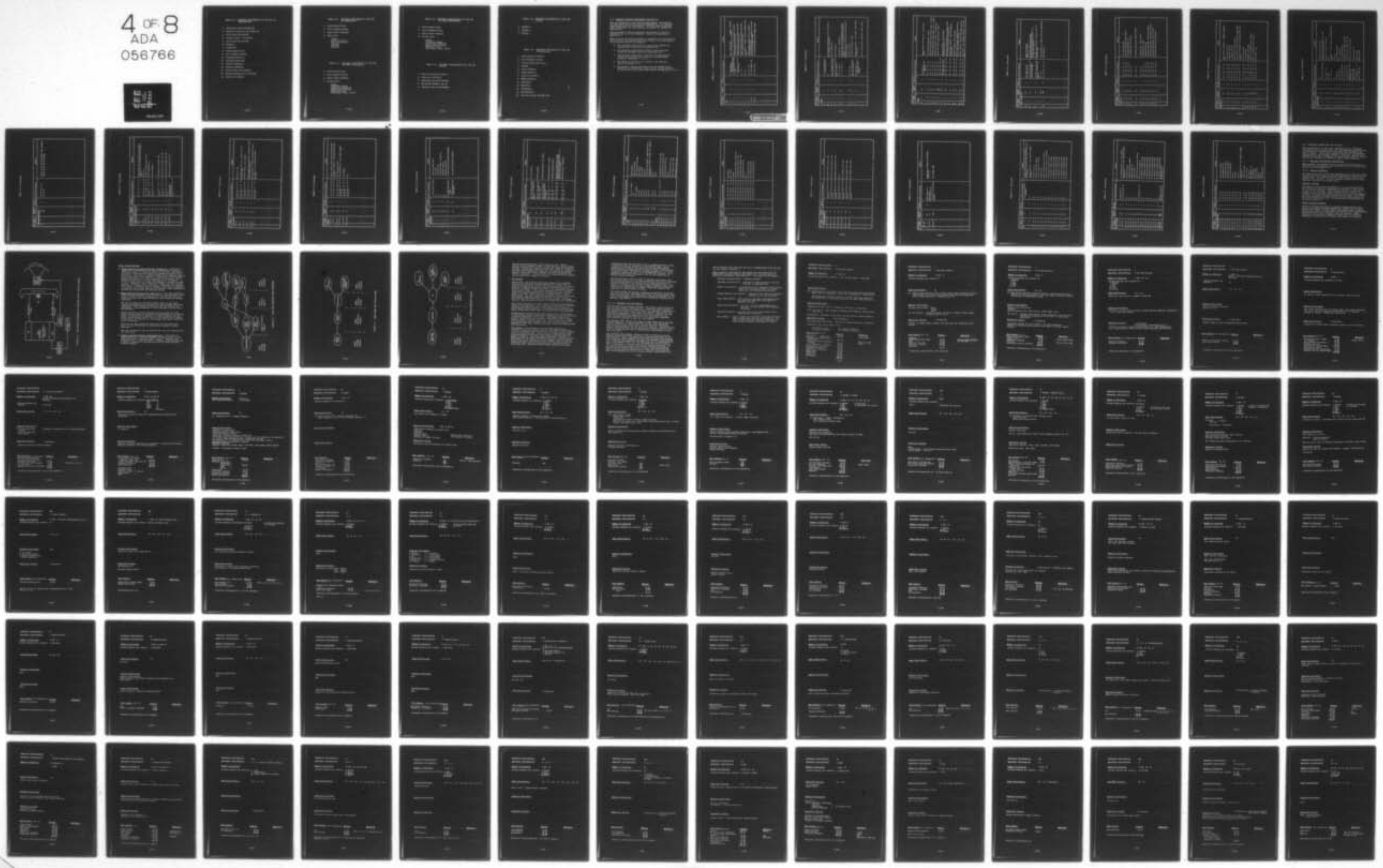

TABLE C-10. EQUIPMENT CONFIGURATION IV LIST FOR 378 COMMUNICATIONS

1. Transceiver SSB-HF AN/URC-58V
2. Receiver Transmitter RT-790/URC-58
3. Patch Panel SB-2744/SRT
4. Control Panels - C-1138B/UR
5. Patch Board SB-2727/SRR
6. AN/URC-51
7. R-390A/URR
8. Sound Powered Phone
9. Dial Telephone System
10. Telegraph AN/UCC-1D
11. Teletype AN/UGC-25A
12. Counter AN/USM-207
13. Receiver AN/WRR-3B
14. Control Radio Set C6282A/U
15. Receiver/Transmitter RT-1035/GR
16. Receiver R-1156/GR

TABLE C-11. EQUIPMENT CONFIGURATION V LIST FOR 378 ENGINEERING

1. Sound Powered Phone
2. Dial Telephone System
3. Engine Order Telegraph
4. Power Panel

    Alarms
    Generator Status
    Power Distribution
    Controls
    Switches
    Metering

TABLE C-12. EQUIPMENT CONFIGURATION VI LIST FOR 378 ENGINE ROOM DIESEL

1. Sound Powered Phone
2. Dial Telephone System
3. Engine Order Telegraph
4. Control Panel

    Alarms
    Propulsion System
    Start/Stop Sequencing
    Engine Power Response
    Propeller Pitch
    Fuel Pumps, Tanks, Valves

TABLE C-13. EQUIPMENT CONFIGURATION VII LIST FOR 378 ENGINE ROOM TURBINE

1. Sound Powered Phone

2. Dial Telephone System

3. Engine Order Telegraph

4. Control Panel

   Alarms
   Propulsion System
   Start/Stop Sequencing
   Engine Power Response
   Propeller Pitch
   Fuel Pumps, Tanks, Valves

TABLE C-14. EQUIPMENT CONFIGURATION VIII LIST FOR 378 ASW

1. Sonar Set Sounding AN/UQN-4

2. Sonar Set C-CSF-66131

3. Communications Sonar AN/WQC-2

4. ASW Plotter MK-NC-2, Mod 2A

5. Indicator Sonar ID-1244/SQW13

TABLE C-15. EQUIPMENT CONFIGURATION IX LIST FOR 378 EW

1. AN/WLR-1C
2. AN/WLM-3
3. AN/WLR-3

TABLE C-16. EQUIPMENT CONFIGURATION X LIST FOR 378 NAVIGATION

1. Sound Powered Telephone
2. Dial Telephone System
3. Plotting Table and Charts
4. Alidade
5. Loran AN/SPN-45
6. LORAN AN/SPN-23
7. Radio Nav AN/SRN-9
8. OMEGA AN/SRN-12
9. Fathometer
10. Speed Log
11. Gyrocompass
13. ADF AN/URD-4D
14. Direction Finder C2L-ADF-100T

C3.0 GENERATE SIMULATOR REQUIREMENTS FOR THE 378

With the definition of the training requirements, the personnel for each lesson plan and the ten ship departments, the simulator requirements had to be established. The effort was to generate input requirements for the simulator to generate to perform the lesson plans.

This generated 26 input requirements and created 78 simulator configurations to run 185 scenarios. These are correlated in Table C-17.

Table C-17 was the working document to correlate training scenarios with simulator configurations, and the following is an explanation of how this correlation is presented.

- The reference number refers to the present REFTRA and Training Afloat Scenarios (Paragraph C2.0).
- The equipment configuration refers to the previously listed ten equipment mock-ups (Paragraph C2.2).
- The simulator configuration refers to the subsequently listed configurations for which cost estimates were generated (Paragraph C-3.1.1.3).
- The number of scenarios are listed on the reference sheets (Paragraph C2.0).
- The simulator inputs required to run the scenarios are referenced in alphabetical order and are further detailed on the simulator cost development sheets (Paragraph C-3.1.1.3).

TABLE C-17. SIMULATOR REQUIREMENTS

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
CIC					
2	1	1	5	(a) Radar (Nav) Communications	Nav, DRT Failure. Probably coordinate NAV; later coordinate with bridge
3	1	2	12	(b) Gyro-Speed-Fathometer + Mult targets, ship, planes	Support by STD training; support from NAV; later coordinate with bridge
5	1	3	4	(c) Ship motion set and drift forces	Support by STD training. Support from NAV; later coordinate with bridge
6	1	4	2	(a) & (c)	Support by STD Training. Support from NAV; later coordinate with bridge
35	1	4	1	(a) & (c.	Gyro failure. Support for NAV, coordinate with bridge
8	1	5	2	(a), (b) & (c)	Single target in water (wind and current) Later support bridge
7	1& 2	6	6	(d) Air target + IFF	Air search (probably in conjunction with rest of CIC); later support bridge
6A	1& 2	7	7	(a),(b),(c),(d)	Air and Surface Track; later support bridge

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
BRIDGE					
45	3	8	1	(e) Basic bridge mockup + communications	
58	3	8	1	(e)	Could support procedures with CIC, Comm, Eng. & Nav functions - procedures.
37	3	9	2	(e), (f) Need basic ship motion response to helm	Getting underway (c)
36	3	10	1	(e), (f), (g) Engine response to orders	Getting underway
51	3	11	2	(e), (f) and (g)	Helo scenario - procedures
65	3	11	3	(e), (f), and (g)	Could be done with CIC operations in support. Could be done with Navigations Operational in support. Could be done with Communications Operational in failure of Radar.
42	3	11	2	(e), (f), (g)	No Visability Nav.
46	3	12	2	(e), (f), (g) and (h) Add tow forces motion	Procedures +navigation (tow)
38	3	13	1	(e), (f), (g) + (i) Motion equation expand steer with engines	Emergency procedures - fail rudder - steer Engine + Engineering
					h-Tow; i-Engine Steer; l-Anchor; m-Dock; n-Helo

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
VISUAL					
40	3	14	2	(e), (f), (g) + (j) Visual Min 100° night NAV	Should support with CIC, NAV. Loss of Gyro. Visual
47	3	14	2	(e), (f), (g), (j)	Man overboard procedures. Visual
33	3	14	2	(e), (f), (g), (j)	Emergency procedures failed eninge + Engr. - Visual
34	3	14	2	(e), (f), (g), (j)	Emergency procedures jammed rudder + Engr. - Visual
43	3	14	3	(e), (f), (g), (j)	Support CIC and NAV - Visual - Precision NAV
39	3	14	1	(e), (f), (g), (j)	Support CIC, NAV, Communications - Visual
-	3	14A	-	(e), (f), (g), (i), (j)	
57	3	15	2	(e), (f), (g), (j).+ (k) Night ship in FOV	Emergency breakaway. Replenishment. Increase FOV Port + 50°
49	3	15	2	(e), (f), (g), (j), (k)	Search and visits procedures, navigation could also expand to daylight. Increase FOV.
50	3	15	2	(e), (f), (g), (j), (k)	Search, board, capture. Could use daylight. Increase FOV.
54	3	15	3	(e), (f), (g), (j), (k)	Underway transfer. Also, daylight.
55	3	15	2	(e), (f), (g), (j), (k)	Underway Provisioning (consider engineering as well). Also, potential daylight.
56	3.	15	2	(e), (f), (g), (j), (k)	Underway fueling. Consider engineering as well.
25	3	15	2	(e), (f), (g), (j), (k)	SAR problem - Also, consider daylight + CIC, NAV, Comm

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
VISUAL (continued)					
41	3	16	2	(e), (f), (g), (j) + (l) Anchor Forces	Support CIC and NAV Support CIC and NAV
44	3	17	3	(e), (f), (g), (j), (k) + (m) Dock, Mooring Forces + Dock Scene	Dock Forces, Mooring Line Forces. Potential close-in daylight scene. Increase Field of View portside 50°, i.e., 100° port 50° starboard
52	3	18	2	(e), (f), (g), (j), (k) + (n) Helo in visual and radar	Coordinate with helo ops + similar to 49, 50 CIC, NAV, Comm
	3	18A		(e) - (n)	Bridge Summation to support other ship subsystems
46	3	18B	2	(e), (f), (g), (h), (j)	SAR problem tow

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
BRIDGE/CIC					
51	1,3	19	2	(a) - (g), (j), (k)	Helo coordinate comm
65	1,3	19	3	(a) - (g), (j), (k)	Coordinate NAV/COMM, Radar Failure
42	1,3	19	2	(a) - (g), (j), (k)	Coordinate NAV/COMM, Fog
40	1,3	20	2	(a) - (g), (j)	Coordinate NAV, Gyro Failure
33	1,3	20	2	(a) - (g), (j)	Coordinate Engineering, Engine Failure
43	1,3	20	3	(a) - (g), (j)	Coordinate NAV. Precision NAV
39	1,3	20	1	(a) - (g), (j)	Coordinate NAV - COMM
57	1,3	21	2	(a) - (q), (j), (k)	Emergency Breakaway
54	1,3	21	3	(a) - (g), (j), (k)	Coordinate NAV, COMM Dual ship operation.
55	1,3	21	2	(a) - (g), (j), (k)	Coordinate Engineering Dual ship provisions.
56	1,3	21	2	(a) - (g), (j), (k)	Coordinate Engineering Dual ship fuel.
25	1,3	21	2	(a) - (g), (j), (k)	Coordinate NAV, COMM SAR problem.

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
BRIDGE/CIC					
2	1,3	21	5	(a) to (g), (j), (k)	NAV, Fog NAV, Procedures. Probably coordinate NAV
3	1,3	21	12	(a) to (g), (j), (k)	Coordinate with NAV
5	1,3	21	4	(a) to (g), (j), (k)	Coordinate with NAV
6	1,3	21	2	(a) to (g), (j), (k)	Coordinate with NAV
35	1,3	21	1	(a) to (g), (j), (k)	Gyro failure. Support for NAV
8	1,3	21	2	(a) to (g), (j), (k)	Single target in water (wind and current both)
7	1,3	21	6	(d) to (g), (j), (k)	Air search (probably in conjunction with rest of CIC)
6A	1,3	21	7	(a) to (g), (j), (k)	Air Surface Track
41	1,3	22	2	(a) - (g), (j), (l)	Coordinate NAV
52	1,3	23	2	(a) - (g), (j), (k), (n)	Coordinate NAV, COMM
41	1,3	23A	2	(a) to (g), (j), (l)	Anchor - CIC Support (Fog or Visual)
44	1,3	23B	3	(a) to (g), (j), (k), (m)	Dock - CIC Support (Fog or visual)
46	1,3	23C	2	(a) to (g), (h), (j), (k)	SAR Problem - tow

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
COMMUNICATIONS					
19	4	24	2	(o)	Procedures could use mockup
4	4	24	9	(o) Voice, CW, AAW, ASW	Probably operate with bridge, CIC, ENG Support with STD Training
10	4	25	6	(p) Navy, HF, MF	Procedures, tuning, calibration
11	4	26	1	(q) Fleet	Setup
12	4	27	1	(o), (p), (q)	Procedures - could be mockup of communications center
18	4	28	2	(r)	TTY nets
14	4	28	2	(r) SSB, AM	Sonar communications
23	4	29	2	(o),(p),(q),(r)	Voice procedures
72	4	30	2	(s) Sound power phone	Part of STD training
16	4	31	2	(o),(p),(q),(r),(s)	Coordinate with bridge, CIC, ENG
15	4	31	2	(o),(p),(q),(r),(s)	Coordinate with bridge, CIC, ENG
5	4	31	3	Instructor Input (o-s) Tactical Comm	Operate with bridge, CIC, NAC
6	4	31	2	Instructor COMM Input (o)-(s)	Support bridge, CIC
58	4	31	1	Get underway (o - s)	Support Bridge
39	4	31	1	Ship to ship comm	Support Bridge

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
COMMUNICATIONS/SECURE					
13	4	31A	2	HF, UHF (o) to (s)	Support of CIC, Navy Procedures, Add'l Equipment
17	4	31A	4	(o) to (s)	Support of CIC, Navy Procedures

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
COMMUNICATIONS/BRIDGE/CIC					
65	3,4	32	3	(e),(f),(g), (o) to (s)	Could be done with CIC operations in support, Could be done with Navigations Operational in support.
42	3,4,	32	2	(e),(f),(g), (o) to (s)	Support 65
4	1,2,3,4	32	9	(e),(f),(g), (o) to (s)	Probably operate with CIC, ENG.
14	1,2,3,4	34	2	(a) to (g), (j),(k), (o) to (s)	Sonar communications
23	1,2,3,4	34	2	(a) to (g), (j),(k), (o) to (s)	Voice procedures
72	1,2,3,4	34	2		
19	1,2,3,4	34	2	(a) to (g), (j),(k), (o) to (s)	Procedures use with NAV, ENG.
16	1,2,3,4	34	2	(a) to (g), (j),(k), (o) to (s)	Coordinate with Bridge, CIC, ENG.
15	1,2,3,4	34	2	(a) to (g), (j),(k), (o) to (s)	Coordinate with Bridge, CIC, ENG.
5	1,2,3,4	34	3	Instructor Input Tactical Comm. (a) to (g), (j),(k), (o) to (s)	Operate with Bridge, CIC, NAV

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
BRIDGE/COMM					
39	3,4	32	1	(e),(f),(g),(j),(k),(n) & (o) to (s)	Support CIC, NAV
52	3,4	32	2	(e),(f),(g),(j),(k) + (n) & (o) to (s)	Coordinate with helo ops + similar to 49, 50 CIC, NAV, COMM
54	3,4	32	3	(e),(f),(g),(j),(k),(n) & (o) to (s)	Underway transfer; also, daylight
55	3,4	32	2	(e),(f),(g),(j),(k),(n) & (o) to (s)	Underway provisioning (consider engineering as well). Also, potential daylight
56	3,4	32	2	(e),(f),(g),(j),(k),(n)	Underway fueling. Consider engineering as well.
25	3,4	32	2	(e),(f),(g),(j),(k),(n) & (o) to (s)	SAR problem - also, consider daylight + CIC, NAV.

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
CIC/COMM					
8	1,2,4	33	2	(a) to (d) & (o) to (s)	Single target in water (wind and current both)
7	1,2,4	33	6	(a) to (d) & (o) to (s)	Air search (probably in conjunction with rest of CIC)
6A	1,2,4	33	7	(a) to (d) & (o) to (s)	Air and surface track
42	1,2,3,4	34	2	(a) to (g), (j), (k) & (o) to (s)	Low visability (i.e., fog, night, weather)
51	1,2,3,4	34	2	(a) to (g), (j), (k) & (o) to (s)	Helo support
65	1,2,3,4	34	3	(a) to (g), (j), (k) & (o) to (s)	NAV

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
ENGINEERING					
32	5	35	1	(u) Power Panel Comm ER	Emergency Diesel Power
66	5	35	2	(u)	Light Loss
70	5	35	2	(u)	Alternate Power
71	5	35	2	(u)	Coordinate bridge - Power Loss
73	5	35	1	(u)	Secondary casualty
74	5	35	1	(u)	Emergency procedures
B	6	36	13	(v) Engine Room Control Diesel	Diesel propulsion emergency procedures
C	7	37	15	(w) Engine Room Control Gas Turbine	Gas turbine emergency procedures

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
BRIDGE/ENGINEERING					
37	3,5,6,7	38	2	(e), (f), (g), (i), (j) + (u), (v), (w) Need basic ship motion response to helm	Getting underway
36	3,5,6,7	38	1	(e), (f), (g), (i), (j) + (u), (v), (w) Engine response to orders	Getting underway
38	2,5,6,7	38	1	(e), (f), (g), (i), (j) + (u), (v), (w) Motion equation expand steer with engines	Emergency procedures - fail rudder
33	3,5,6,7	38	2	(e), (f), (g), (i), (j) + (u), (v), (w)	Emergency procedures - engine
34	3,5,6,7	38	3	(e), (f), (g), (i), (j) + (u), (v), (w)	Emergency procedures rudder
44	4,5,6,7	38A	3	(c), (f), (g), (i), (j) (k) + (m) (u), (v), (w)	Dock Forces, Mooring Line forces. Potential close-in daylight scene Increase Field of View portside 50°, i.e., 100° port 50° starboard
56	3,5,6,7	38B	2	(e), (f), (g), (j), (k) (u), (v), (w)	Underway fueling. Engineering

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
ASW					
A1	8	39	1	(x), B.T. Traces	ASW Procedures
A2	8	39	1	(x)	Emergency Procedure
A3	8	40	4	(y), targets	Team, doctrine, track plot
A4	8	41	3	(x),(y)	Team defense
A5	8	41	1	(x),(y)	Team, attack
A6	8	41	7	(x),(y)	Operation
A7	8	41A	2	(x),(y)	Coordinate with weapons. Expand Instruction.
A8	8	41B	1	(x),(y)	Coordinate with Weapons, Bridge, CIC. Expand In instruction
A9	8	41B	1	(x),(y)	Track
A10	8	41B	2	(x),(y)	Attack
CIC/ASW					
A11	1,2,8	42	4	(x),(y) + (a) to (d)	Coordinated multi-vehicle, comm
A12	1,2,8	42	4	(x),(y)	Coordinated multi-vehicle, comm
A13	1,2,8	42	3	(x),(y)	Coordinated multi-vehicle.
A14	1,2,8	42	1	(x),(y)	Basics
A15	1,2,8	42	2	(x),(y)	Multi-vehicle, plot, comm
A16	1,2,8	42	2	(x),(y)	Multi-vehicle, plot, comm
A17	1,2,8	42	2	(x),(y)	Multi-vehicle, plot, comm

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
CIC/ASW/BRIDGE					
A4	1,2,3,8	43	3	(x),(y),(a)to(g) + (j),(k)	Team defense
A5	1,2,3,8	43	1	(x),(y),(a)to(g) + (j),(k)	Team, attack
A6	1,2,3,8	43	7	(x),(y),(a)to(g) + (j),(k)	Operation
A8	1,2,3,8	43	1	(x),(y),(a)to(g) + (j),(k)	Coordinate with weapons, Bridge, CIC
A11	1,2,3,8	43	4	(x),(y),(a)to(g) + (j),(k)	Coordinated multi-vehicle, comm
A12	1,2,3,8	43	4	(x),(y),(a)tc(g) + (j),(k)	Coordinated multi-vehicle, comm
A13	1,2,3,8	43	3	(x),(y),(a)to(g) + (j),(k)	Coordinated multi-vehicle
A14	1,2,3,8	43	1	(x),(y),(a)to(g) + (j),(k)	Basics
A15	1,2,3,8	43	2	(x),(y),(a)to(g) + (j),(k)	Multi-vehicle,plot,comm
A16	1,2,3,8	43	2	(x),(y),(a)to(g) + (j),(k)	Multi-vehicle,plot,comm
A17	1,2,3,8	43	2	(x),(y),(a)to(g) + (j),(k)	Multi-vehicle,plot,comm

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
CIC-ASW/BRIDGE/COMM					
A11	1,2,3,4,8	44	4	(x),(y),(a)to(g)+(j),(k)+(o)to(s)	Coordinated multi-vehicle, comm
A12	1,2,3,4,8	44	4	(x),(y),(a)to(g)+(j),(k)+(o)to(s)	Coordinated multi-vehicle, comm
A13	1,2,3,4,8	44	3	(x),(y),(a)to(g)+(j),(k)+(o)to(s)	Coordinated multi-vehicle, comm
A14	1,2,3,4,8	44	1	(x),(y),(a)to(g)+(j),(k)+(o)to(s)	Basics
A15	1,2,3,4,8	44	2	(x),(y),(a)to(g)+(j),(k)+(o)to(s)	Multi-vehicle, plot, comm
A16	1,2,3,4,8	44	2	(x),(y),(a)to(g)+(j),(k)+(o)to(s)	Multi-vehicle, plot, comm
A17	1,2,3,4,8	44	2	(x),(y),(a)to(g)+(j),(k)+(o)to(s)	Multi-vehicle, plot, comm

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
	CIC - EW				
9	9	45	4	Radio Signals (z)	Stimulation for AN/URD-4D, Coordinate Bridge, CIC
9	1,2,3,9	46	4	Radio Signals (a)-(g),(j),(k)+(z)	
9	1,2,3,4,8 9	46A		(a)-(g),(j),(k)+(o)to(s)+ (x)to(z)	CIC, Bridge, Comm.

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
NAV/2	10	47	2	(t) NAV for LORAN DF equipment	Possible sextant, stadimeter, barometer, anemometer, alidade (if right optics for visual--DRT Failure)
6	10	47	2	(t)	Support bridge CIC; also, magnetic compass, fathomater
58	10	47	1	(t)	Energize and tune
37	10	47	1	(t)	Compensate magnetic compass
42	10	47	2	(t)	Support bridge, CIC, Fog NAV
38	10	47	1	(t)	Support bridge
40	10	47	2	(t)	Support bridge during gyro failure
41	10	47	2	(t)	Support for NAV + charts and planning
5	10	47	1	(t)	As reauired to support Bridge
35	10	47	1	(t)	As required to support Bridge
45	10	47	1	(t)	As required to support Bridge
58	10	47	1	(t)	As required to support Bridge
38	10	47	1	(t)	As required to support Bridge
47	10	47	1	(t)	As required to support Bridge
43	10	47	1	(t)	As required to support Bridge
4	10	47	1	(t)	As required to support Bridge

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
CIC/BRIDGE/NAV					
2	1,3,10	48	2	(a)to(g),(j),(k)	Low visibility Nav (i.e., fog, weather)
6	1,3,10	48	2	(t)+(a)to(g)+(j),(k)	Support bridge CIC; also, magnetic compass, fathomater
58	1,3,10	48	1	(t)	Energize and tune
37	1,3,10	48	1	(t)	Compensate magnetic compass
42	1,3,10	48	2	(t)	Support bridge, CIC
38	1,3,10	48	1	(t)	Support bridge
40	1,3,10	48	2	(t)	Support bridge during gyro failure
41	1,3,10	48A	2	(t) (a)to(g) (j) (l)	Anchor CIC & NAV Support
5	1,3,10	48	1	(t)	As required to support Bridge
35	1,3,10	48	1	(t)	As required to support Bridge
45	1,3,10	48	1	(t)	As required to support Bridge
58	1,3,10	48	1	(t)	As required to support Bridge
38	1,3,10	48	1	(t)	As required to support Bridge
47	1,3,10	48	1	(t)	As required to support Bridge
43	1,3,10	48	1	(t)	As required to support Bridge
4	1,3,10	48	1	(t)	As required to support Bridge
44	1,3,10	48B	3	(a)to(g),(j),(l),(t)	Docking CIC & NAV
46	1,3,10	48C	2	(a)to(g),(j),(l),(t)	SAR Problem Tow

TABLE C-17 (continued)

REF #	EQUIP. CONFIG.	SIMULATOR CONFIG.	NO. OF SCENARIOS	INPUT FOR SIMULATOR	REMARKS
BRIDGE/CIC/ENGR/COMM					
3	1 to 10	49	12	(a) to (z)	Set & Drfit problems
57	1 to 10	49	2	(a) to (z)	Replenishment at sea
49	1 to 10	49	2	(a) to (z)	ELT (Search and Visit)
50	1 to 10	49	2	(a) to (z)	ELT(Search and Capture)
52	1 to 10	49	2	(a) to (z)	Helo Ops Coordinated
25	1 to 10	49	2	(a) to (z)	SAR Ops
11	1 to 10	49	2	(a) to (z)	Fleet Ops
2	1 to 10	49	2	(a) to (z)	Fog Nav
6	1 to 10	49	2	(a) to (z)	Support bridge CIC; also, magnetic compass, fathometer
58	1 to 10	49	1	(a) to (z)	Energize and tune
38	1 to 10	49	1	(a) to (z)	Rudder Failure
40	1 to 10	49	2	(a) to (z)	Gyro Failure
46	1 to 10	49	2	(a) to (z)	SAR Problem - Tow
47	1 to 10	49	2	(a) to (z)	Man overboard
33	1 to 10	49	2	(a) to (z)	Engine Failure
34	1 to 10	49	2	(a) to (z)	Rudder Failure
41	1 to 10	49	2	(a) to (z)	Anchoring
44	1 to 10	49	3	(a) to (z)	Docking
52	1 to 10	49	2	(a) to (z)	Coordinated Helo

C3.1 SIMULATOR CAPABILITIES FOR 378 SHIP

With the definition of the input requirements to be simulated, correlated with the lesson plans, and the equipment configurations, the following 78 configurations were analyzed to determine the cost to procure. These costs included the cost for the equipment configurations, the necessary hardware, computers, computer peripherals and software to generate the input signals and the instructor station hardware and software to operate the simulators.

C3.1.1 Simulator Manufacturer Capabilities

Where possible the equipment that was closest to requirements of the simulator configuration was correlated with the simulator manufacturer catalog (Appendix B).

C3.1.2 Simulator Fidelity

The fidelity for each of the ship departments other than the bridge has been obtained to meet the general requirements dictated by the lesson plans. The bridge functional inputs for the sensor again provide little problem. The only selection problem for the ship simulator represents the bridge visual.

Overview - Bridge

The computer controlling ship dynamics is a relatively straightforward design and may be programmed to simulate any size vessel in a real-time situation. Every bridge simulator is and must be capable of this function. The real-time output is fed to the hardware controlling the visual scene and the navigation equipment to update the ship's relative position and attitude. This output may also be applied to a motion base to deliver added realism to the trainee (see Figure C-5). No motion base is planned for the 378 ship simulator.

Vessel Dynamics Processor

The basic dynamics processor is a general purpose digital processor whose program has been generated to operate on the inputs made by the student via helm commands and engine order telegraph. The program consists of algorithms concerned with hull hydrodynamics obtained from two tank testing or trial run results. These algorithms can be readily trimmed to ensure that the simulator reproduces faithfully to the student the response of the ship.

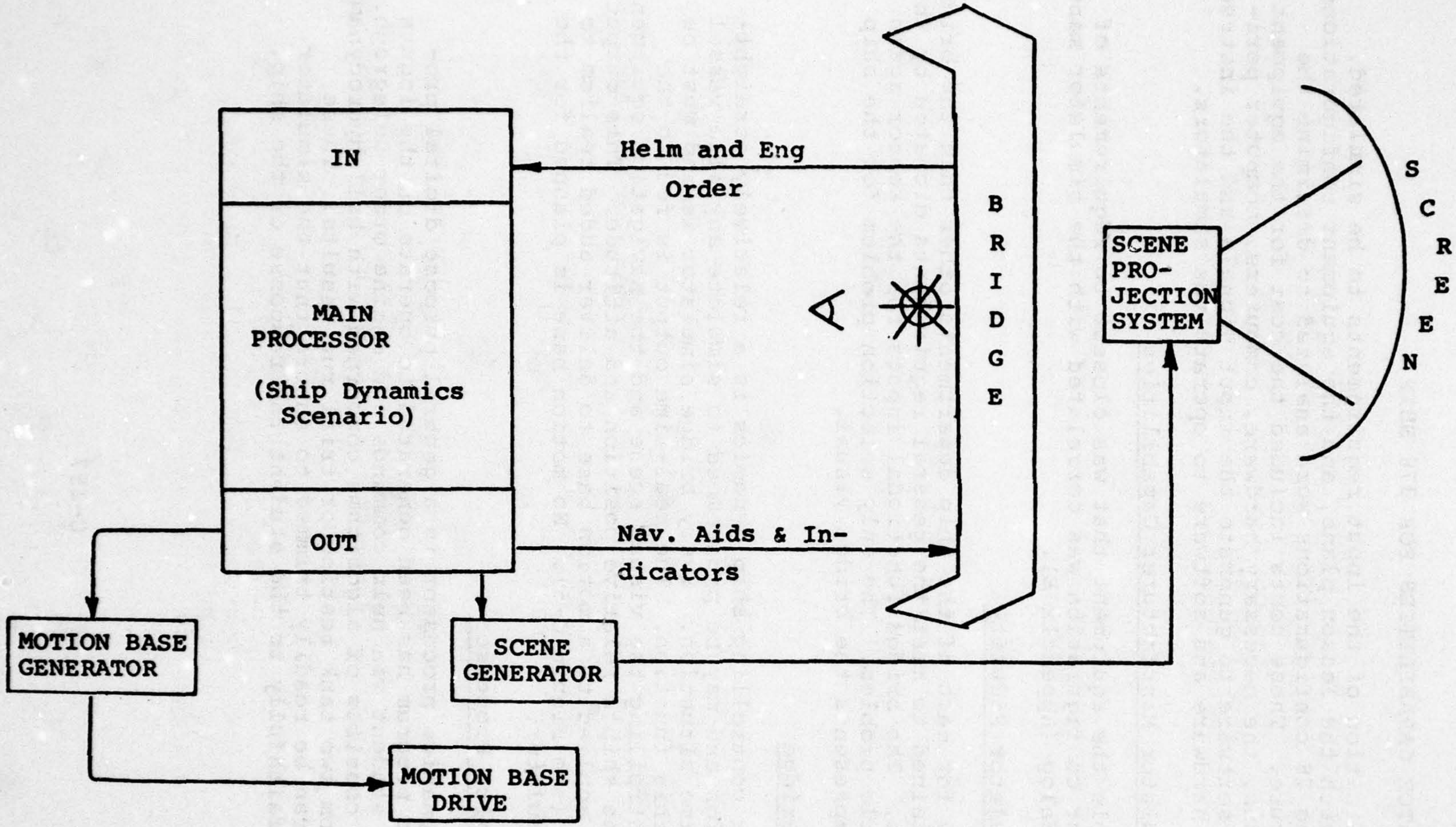

FIGURE C-5. FULL-BRIDGE SHIPHANDLING SIMULATOR (BASIC BLOCK DIAGRAM)

Visual Scene Processor

- Slide and Projector Scene Generator (Figure C-6) - One form of visual scene is produced by the use of slides and projectors casting an image on a screen of some field of view. The greater the field of view the more complex the program to control the projectors. This type of system produces a high degree of realism but is restricted to one scenario. A deviation in a previously photographed course will cause distortion of the scene. The greater the deviation, the more distortion will be visible. It is not an easy matter to change the scenario in relation to time or cost. Generally, when a scenario is chosen for this type of simulator it is essentially hard wired. Basically, each scenario will require a different group of slides. This type of approach is generally the highest fidelity for daylight visual presentation but was not selected for the candidate system.

- Model Board and Optical Probe (Figure C-7) - One basic technique which has been developed to a high level of sophistication is the terrain (model) board for image storage, the optical probe and television camera for image generation, and a variety of display techniques.

  The optical probe and television camera "look" at the scale terrain model defined by craft position and attitude, with video information thus generated representing the real world visual environment. This information is then displayed to the pilot in the simulator.

  Visual simulation systems employing optical probes and scale terrain relief models are currently being manufactured by several firms, including Sperry, Redifon, the Singer Company, and CAE. These devices possess narrow field of view capabilities, usually on the order of 60 degrees on the diagonal and exhibit depth-of-field limitations.

  This type of image generation system may be considered hard wired in that the scenario is not quickly changed or easily developed.

  This type of approach was not selected for the cost estimates for the 378 bridge.

- Computer Generated Imagery (CGI)(Figure C-8) - This form of image generation is the most flexible and sophisticated of any display generation system available to date. Scenarios are programmed into a large data base. Changing a scenario requires a change in program or data base only and all other hardware remains constant.

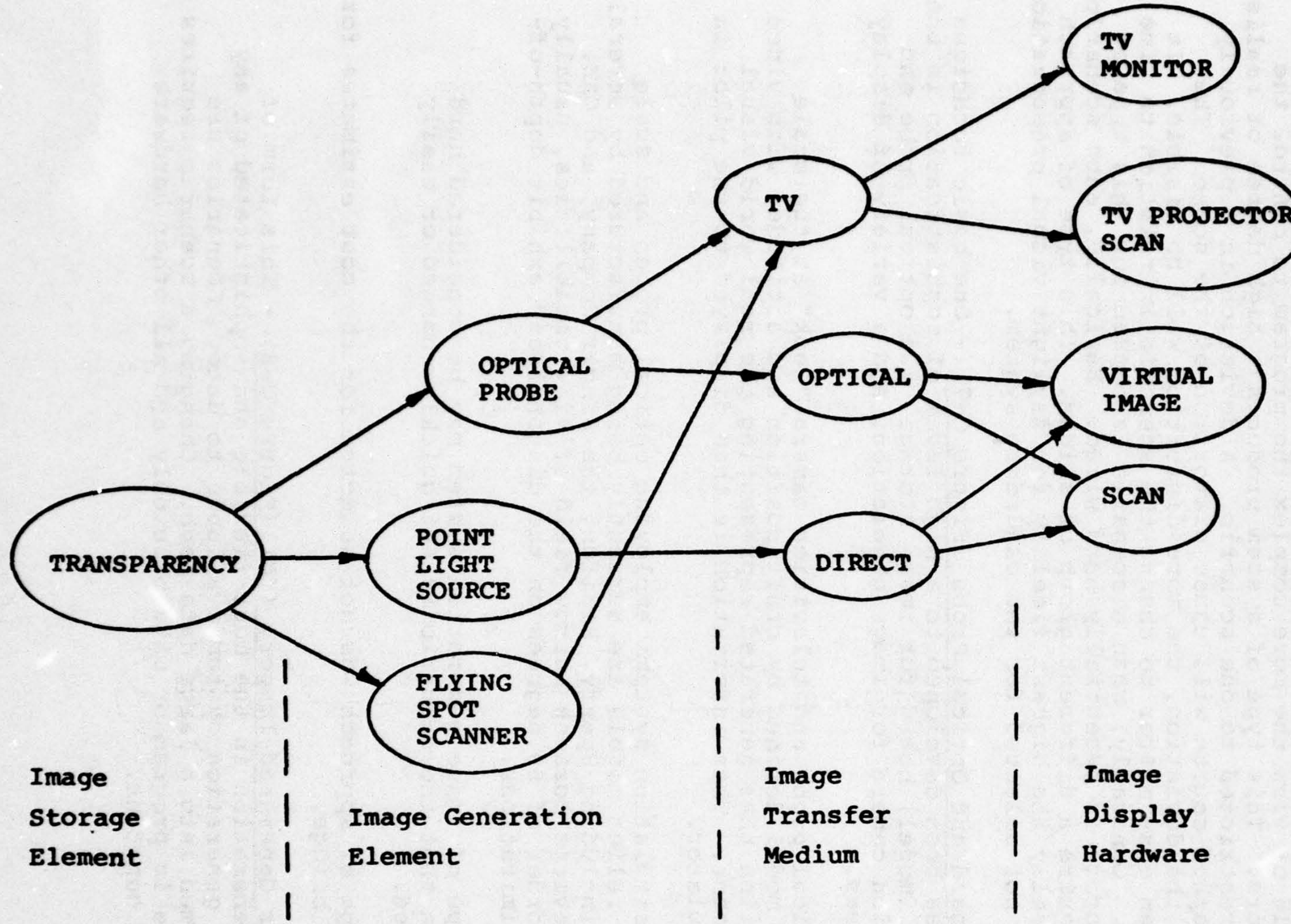

FIGURE C-6. SLIDE AND PROJECTOR SCENE GENERATOR

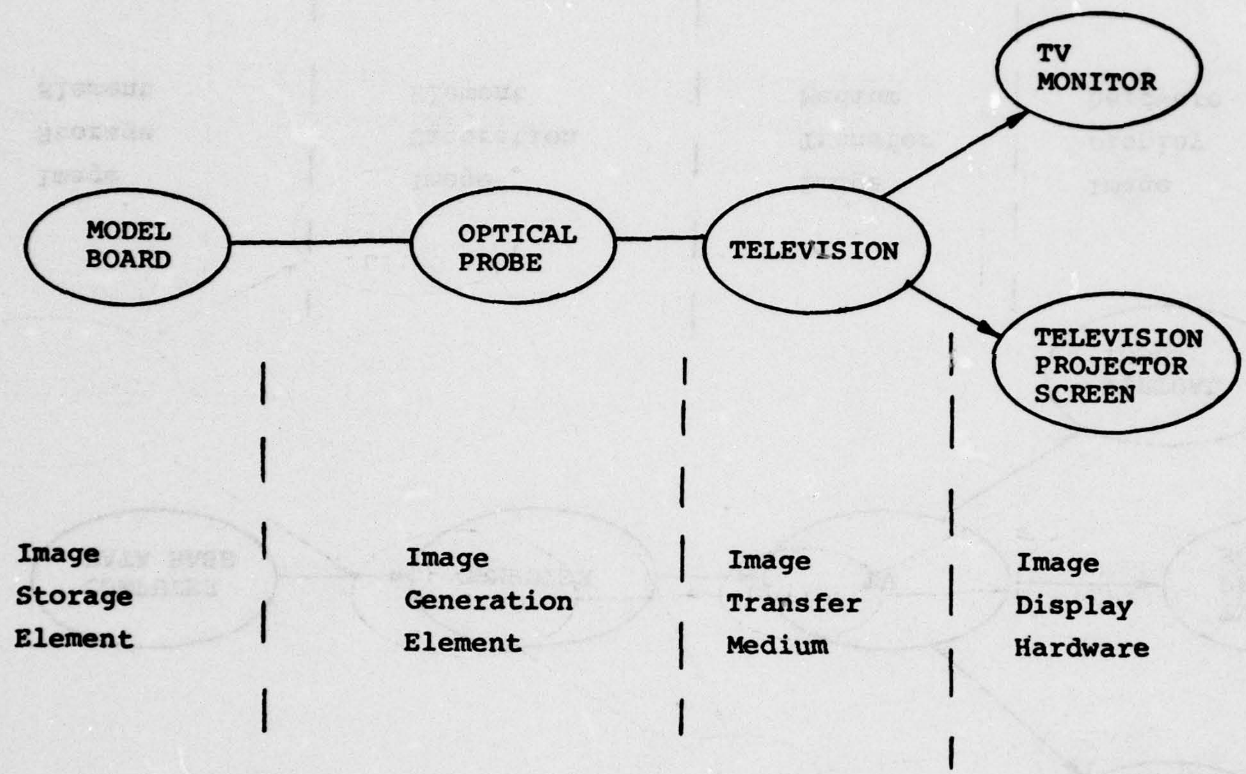

FIGURE C-7. MODEL BOARD AND OPTICAL PROBE

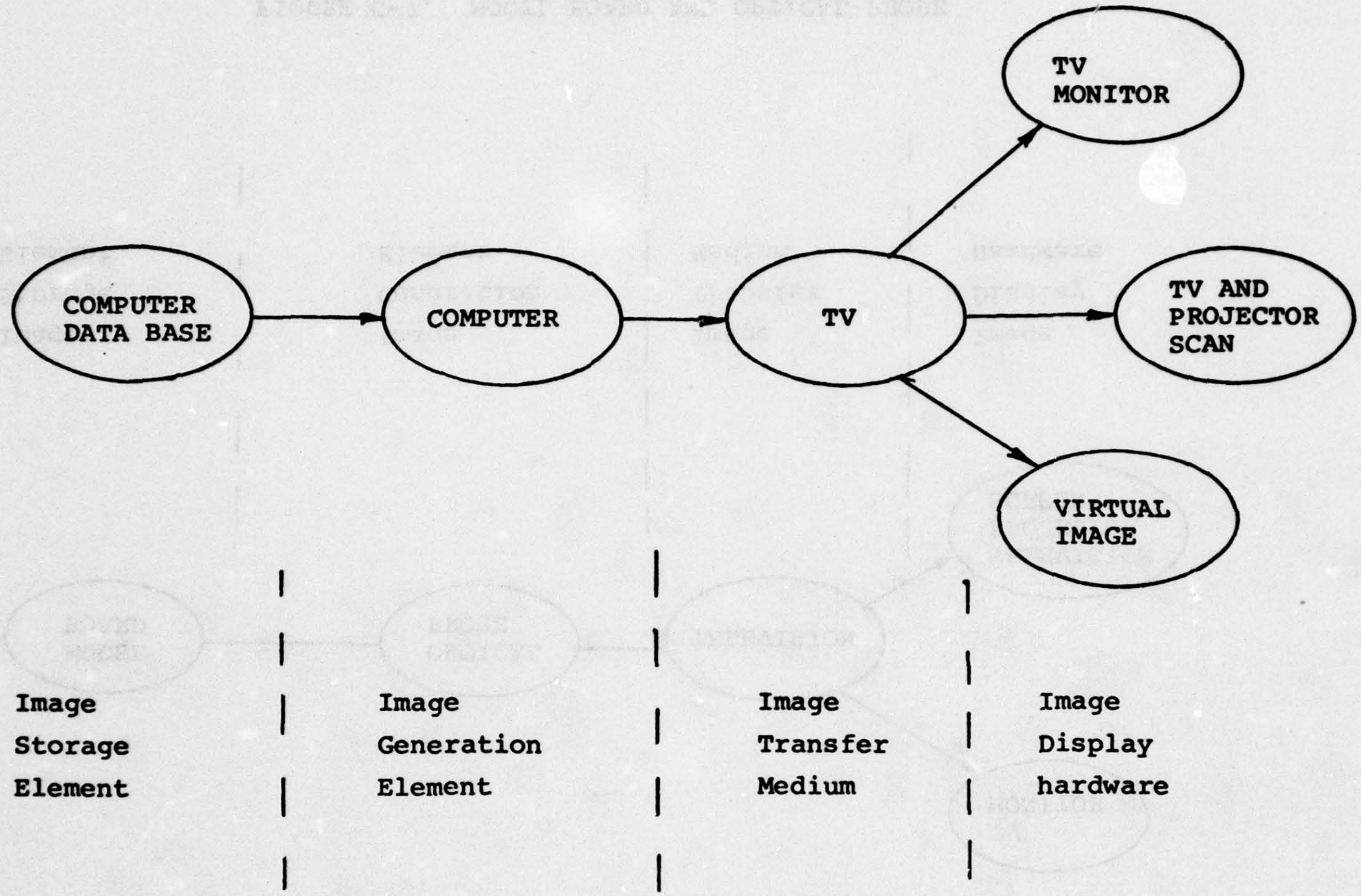

FIGURE C-8. COMPUTER-GENERATED IMAGERY

The greatest disadvantage of this system is the 'cartoon effect' of the displayed image. Since there is a finite number of video elements that can be processed per frame the detail is limited. A generated image will look like a ship at a distance, but upon close passage the image does not present the smaller details such as port holes, antennas or other attributes not seen at a distance. In other words, the image generally changes in size only with a change in distance.

- CGI Systems

RASTER SCAN - The computer generated imagery (CGI) technique utilizes the memory or storage elements of the processor to store the visual scene in the form of binary values. The scene consists of surface patterns or objects formed by planes of different intensity levels which are in turn bounded by straight lines called "edges." The raster scanned display is produced from video signals generated from the computer output and produces a 'cartoon' effect but does in general depict a real-world scene. The total stored environmental data base utilizing contemporary computer storage devices such as discs, tape, etc., may be much larger than the working storage. The CAORF computer image generation system is an example of this technology.

The salient features of the CGI approach are exact perspective, moving object generation, quick change of scene content, variable altitude, attitude and rates, large gaming area and ease of multi-channel image generation. This system also requires less space and building height than the terrain model board approach.

Disadvantages include limited scene content due to limitations in the working storage and processing capability and the resulting 'cartoony' appearance of the scene. Development efforts by several manufacturers are increasing the capabilities of these systems almost 50 percent each year. Thus, the cartoon effects are continuously being reduced. The cost for these types of systems are also being reduced each year, making this type system most attractive.

CALLIGRAPHIC - This concept in visual image generation, a variation of CGI, has evolved over the past several years into a highly acceptable means to generate a realistic night presentation of an airfield area. Scene detail includes horizon glow, runway markings and airfield light-points (including VASI and approach strobes). The calligraphic generation technique is different from the raster scan method utilized in full day/night CGI systems in the generation of the display. With the calligraphic technique, the electron beam is moved directly from one calculated light position to another and is turned on only at those positions. Beam penetration tubes instead of the usual

shadow mask color CRT are often used as a display output. Color is controlled by the intensity of the electron beam. Color rendition is limited to red, green and the spectrum between. Several display channels can be utilized to give a wide horizontal field of view. Advantages of these systems are: (1) relatively low acquisition cost, (2) high MTBF and low MTTR, (3) no additional facilities requirement, and (4) the capability to readily change scenarios.

One disadvantage is that in order to maintain resolution, reliability and simplicity, only beam penetration CRT's can be utilized. This currently rules out utilization of video projectors and limits the display to the folded, on-axis reflective type. This system is not compatible with ship handling simulators requiring large screen displays such as CAORF. Night-only systems are currently in use by several airlines.

The visual system for the ship simulator was based on the generation of night scene, 240-degree projection, and raster scan. This seems to be the best 1977 compromise, allowing the flexibility to go to CGI daylight presentation as the technology develops, as it should in the 1980's.

C3.1.1.3 <u>Simulator Cost Development</u>

The following 78 data sheets represent the analysis which led to the cost for the simulator configurations. These data sheets provide the correlation between the lesson plans, the equipment configuration, the personnel for each scenario and the simulator requirements and instructor requirements. The sheets were used to generate the cost data for the simulator configurations with cost backup for our final estimates and cross reference to the equivalent equipments which might be procured to meet the requirements.

The simulator cost analysis was based on night scene CGI as the most flexible approach. A future assessment of the other approaches (film or model board) demonstrated limited data base flexibility with linear development cost for increased fidelity. CGI should allow greater flexibility with the probability of increased fidelity (daylight or higher density) due to technological improvements in the next five years.

The simulator cost analysis (C-165 to C-242) is based on a multicomputer installation which represents a continuous buildup to the ship simulator. Thus, succeeding configurations expand the training capability and often encompass the cost of proceeding configurations, i.e., simulator Configuration 2 includes the cost of Configuration 1. Each of the sheets (C-165 to C-242) developed the cost of a simulator configuration to perform some set of training scenarios. As the cost-per-hands-on student training hour demonstrated greater efficiency than present operational training, the same format was used to combine training capabilities to establish configurations that would encompass all of the training scenario requirements into

the 21 subunits that comprised the final recommendations used for the 378 cost benefit analysis.

These simulator configuration data sheets are correlated with the operational training analysis (paragraph C2.0) via the tables of simulator requirements (Paragraph C3.0). The format is as follows:

Simulator Configuration: a numbering system

Equipment Configuration: reference to those equipment mock-ups outlined in Paragraph C2.2.

Number of Scenarios: (# of scenarios from simulator lesson plans) Reference 2 relates to Page C-4 to show where the five scenarios are derived.

Average Manpower per Scenario: Average of the number of personnel training in all the scenarios.

Input Requirements: (A-Z) notes on the input requirements which are described when they first appear to determine the cost.

Computer Requirements: (1 - 17) list the requirements for computers in the multiple CPU simulator developed.

Instructor Station: List the action to be controlled or performed by the instructor.

Cost Summary: List of items to be procured to provide the simulator capabilities for that configuration. The cost of some preceding simulator configuration cost analysis should be added when so noted.

SIMULATOR CONFIGURATION 1

EQUIPMENT CONFIGURATION 1 CIC Room Surface

Number of Scenarios 5 - Ref. 2

Average manpower per scenario 7 XO, CIC/EW, Elect, 4 Enlisted

Input Requirements

(a) Radar input of navigation data using real-world data from DMA-HC data base with fathometer, speed log, gyrocompass, communication.

Transformation equations offline to online data base generation not priced here. Use offline facility for data base generation.

Computer Requirement

Computer for Radar (NAV), fathometer, speed log, gyrocompass.

CPU, (1) and (2) - dual computer complex, DMA hardware, battery pack-128K core .

Peripherals - Mag tape, 24 MB disk, 300 lpm printer, system console.

Instructor Station One instructor

Not integrated with Bridge. Ship motion under control of instructor.

Instructor uses video terminal for:

(1) Problem setup
(2) System commands
(3) Scenario control
(4) Student evaluation

Cost Summary for (a)	Procure	Reference
CIC Room (Mock Up)	60.0K	Actual Hdw.
Hardware for Radar/Gryro/ Fathometer	100.0K	
Instructor station/communications	25.0K	15F12 at 400K
1 & 2 Computer + I/O Hdw.	60.0K	
Peripherals - Mag Tape	45.0K	
Software Instructor	50.0K	
Instructor - Terminal	3.5K	
Radar (NAV)	100.0K	
Fathometer	50.0K	
Speed Log	50.0K	
Gyrocompass	25.0K	
	568.5K	

SIMULATOR CONFIGURATION 2

EQUIPMENT CONFIGURATION 1 CIC Room Surface

Number of Scenarios 12 Ref. 3

Average manpower per scenario 5

Input Requirements (a)

(b) Radar target generator for multiple ships under instructor control. Should also have A/C and Helo targets which can be coordinated with D target generator, Integrate with (a)

Computer Requirement

Surface Search Radar - Ships
Planes
Helo

No new computer - Target generator resident in Surface Search Radar Processor CPU #1 or 2.

Instructor Station 1 instructor

Control of target ships, planes, own ship wehn not integrated with Bridge.

Cost Summary for (b)	Procure	Reference
Software		
Target Generator Ships	10.0K	Varian Radar Process.
Helo	10.0K	vs. the SEL
Aircraft (for SS)	10.0K	
Instructor Station Software	10.0K	
	40.0K	

\+ Simulator Configuration 1 for operation

SIMULATOR CONFIGURATION 3

EQUIPMENT CONFIGURATION 1 CIC Room Surface

Number of Scenarios 4 Ref. 5

Average manpower per scenario 18
- 4 Bridge
- 2 NAV
- 5 Comm
- 6 Engr.
- 18 CIC

Input Requirements (a), (b)

(c) Ship motion equations advance/transfer, accelerate/decelerate, effects of wind and current on own ship under instructor control. Tide should be considered as well.

Computer Requirement

Computer for ship motion
Software
Motion equation data (ship trials, model basin, etc.)

Use CPU #3 - Combine ships motion, target generator and instructor man/machine interaction in one CPU. No additional peripherals

Instructor Station 1 instructor

Instructor control of wind, current, own ship selection; respond to communication commands; work delay of Bridge, engine room, etc.

Cost Summary for (c)	Procure	Reference
Obtain Ship motion Data	10.0K	
Computer (3)	25.0K	Varian Small Boat
Instructor Display	3.5K	
Software	60.0K	Varian Small Boar
Instructor Station Software	10.0K	
	108.5K	

+Simulator Configuration 2 for operation

SIMULATOR CONFIGURATION 4

EQUIPMENT CONFIGURATION 1 CIC Room Surface

Number of Scenarios 3 Ref. 35, & 6

Average manpower per scenario 16
4 Bridge
2 NAV
10 Comm
10 Engr
16 in CIC

Input Requirements (a) & (c)

Radar NAV, ship motion to support Bridge NAV

Computer Requirement

Interface - Motion Equation/Radar accomplished by computer configuration (i.e., dual port system)

Instructor Station 1 instructor
See Simulator Configuration 1 & 3

Combined instructor station (configuration 3). Add malfunctions (i.e., gyro failure, radar failure, other equipment malfunctions).

Cost Summary for Integration	Procure	Reference
Software Failures	10.0K	
Software Instructor	20.0K	
	30.0K	

+Simulator Configure 3 for operation

SIMULATOR CONFIGURATION 5

EQUIPMENT CONFIGURATION 1 CIC Room Surface

Number of Scenarios	2 Ref. 8
	24 Ref. Simulator Configuration 1-5
	26 Total
Average manpower per scenario	9

Input Requirements (a), (b), (c)

Computer Requirement

None - Possible interfaces
Use CPU + 1 & 2

Instructor Station 1 instructor

Handle target in water (unpowered) SAR problem.

Cost Summary for Integration	Procure	Reference
Software Instructor Control	10.0K	
Set & Drift Target	10.0K	
	20.0K	

+ Simulator Configuration #3 for operation

SIMULATOR CONFIGURATION 6

EQUIPMENT CONFIGURATION 2 CIC Room Air

Number of Scenarios 6 Ref. 7

Average manpower per scenario 3 in CIC

Input Requirements

(d) Add air target generator for air search radar with IFF.

Computer Requirement

Air target generator for air search radar, IFF signal generator.
CPU (4) to Drive equipment configuration and two displays.
Standalone system - independent operations.

Instructor Station 1 instructor

Inserted air target under instructor control; all of previous.

Cost Summary for (d)	Procure	Reference
Peripherals (Disk (10MB)	13.8K	Actual Hdw 2
(4) Computer	25.0K	
Add hardware for Config. 2	25.0K	
Software for IFF	20.0K	
Software Air Search Radar	100.0K	
Instructor Console	3.5K	
Add software for Instructor	25.0K	
Hardware for Air Search Radar	35.0K	
	247.3K	

SIMULATOR CONFIGURATION	7
EQUIPMENT CONFIGURATION	1, 2 CIC Air/Surface

<u>Number of Scenarios</u>

	7 Ref. 6A
	32 Ref. Simulator Configuration 1-6
	39 Total
Average manpower per scenario	12 in CIC

<u>Input Requirements</u> (a), (b), (c), (d)

<u>Computer Requirement</u>

Possible Interface
1 Surface
2 Motion Instructor
3 Air Search

Software in Computer #3 Air target generator

<u>Instructor Station</u> 1 instructor

Instructor control multiple targets

<u>Cost Summary</u> for Integration	<u>Procure</u>	<u>Reference</u>
Run all simultaneously (Surface, Air, Own Ship)		
Reorganize Software	20.0K	
I/O for Correlated Targets	5.0K	CPU 4 to 1, 2, 3
I/O Software	5.0K	
Expanded Software Instructor	15.0K	
	45.0K	

+Simulator Configuration 5 and 6 for operation

SIMULATOR CONFIGURATION 8

EQUIPMENT CONFIGURATION 3 Bridge Mockup

Number of Scenarios 2 Ref. 45 and 58

Average manpower per scenario

for Bridge	4
NAV	2
CIC	9
Engr.	8
Comm.	8
Engr.	10
	41 Total

Input Requirements (e)

Procedures training mockup with communications handled by the instructor.

Computer Requirement

No computer

Instructor Station

Make all necessary communication responses - external and internal. Communications NAV, CIC and Engineering.

Cost Summary for (e)	Procure	Reference
Bridge Room for visual, computer floor, etc.	60.0K	
Bridge equipment (Hdw Con. #3)	140.0K	
Instructor station	10.0K	
Communications	10.0K	
	220.0K	

Equipment Room)
Computer Floor)
Building Bridge) $60.0K
Cable bells)
Lead)

SIMULATOR CONFIGURATION 9

EQUIPMENT CONFIGURATION 3 Bridge

Number of Scenarios 2 Ref. 37
Avg. manpower/scenario 4 on Bridge

Input Requirements (e)

(f) Ship Motion (C) + Bridge response

Computer Requirement

Response to Helm forces
Advance/transfer/rudder angle
Other hydrodynamic effect
Function of enginer failures, speed, etc.
Need radar land mass generation. Config. (1)-(3) excluding CIC operations if combine these operations same on duplicate systems
Buy Computer #5-6-7 peripherials 24 MB disk, Mag Tape, Printer, Systems Console (instructor's console)

Instructor Station

Record: Ship Path, Rudder Angle, Yaw Rate, Ship Speed, Engine Speed

Problem: Wind Speed, Current, Tide

Cost Summary for (f)	Procure	Reference
Computer 5, 6, 7	90.0K	
Software Radar Nav)		
Fathometer)		
Speed Log)	350.0K	
Gyro)		
Motion)		
Trial Data	10.0K	
Instructor Software	50.0K	
Instructor Console	3.5K	
System Peripherals	45.0K	
	548.5K	

+Simulator Configuration 8 for operation

SIMULATOR CONFIGURATION 9A

EQUIPMENT CONFIGURATION 3 Bridge

Number of Scenarios 2 Ref. 37

Average manpower for scenario 4

Input Requirements (e)

(f) Ship motion of CIC + Bridge responses (3)
Radar landmass of CIC to drive Bridge Repeater (1)

Computer Requirement

Instructor Station

Cost Summary	Procure	Reference
Instructor Display	3.5K	
Instructor Software	50.0K	
CPU 5,6,7	90.0K	
Install Software (1)	10.0K	
Install Software (3)	10.0K	
F. Software	40.0K	
System Peripherals	45.0K	
	248.5K	

+Simulator Configuration 8 for operation

SIMULATOR CONFIGURATION 10

EQUIPMENT CONFIGURATION 3 Bridge

Number of Scenarios 1 Ref. 36

Average manpower per scenario
4 on Bridge
2 NAV
4 Comm
4 Engr.
6 CIC
20 people total

Input Requirements (e), (f)

(g) Engine room response to orders.

Computer Requirement Add to CPU #5

Ship motion response to engine room
Dockside
Underway
Shallow Water
Channel effects
Function of rudder failures

Engine room simulation
(no failure, no delay)

Instructor Station

Instructor station procedure for engine room.

Cost Summary for (g)	Procure	Reference
Instructor Software	5K	CPU #7 - Ship motions
Software	25K	
	30K	

+Simulator Configuration 9A for operation

SIMULATOR CONFIGURATION	**11**
EQUIPMENT CONFIGURATION	**3 Bridge**

Number of Scenarios **7 Ref. 51, 65, 42**

Average Manpower per Scenario

4	Bridge
2	NAV
4	Comm
6	Engr.
14	CIC
28	people

Input Requirements **(e), (f), (g)**

Magnetic Compass - Corrections needed
Drive Radar Repeater. Load Software of Configuration 1

Computer Requirement

Use CPU 4 or 5

Instructor Station

Support scenarios

Cost Summary for Integration	**Procure**	**Reference**
Software	**10K**	

+Simulator Configuration 10 for operation

SIMULATOR CONFIGURATION	12
EQUIPMENT CONFIGURATION	3 Bridge

<u>Number of Scenarios</u> 2 Ref. 46

Average manpower per scenario

4	Bridge
2	Nav
4	Comm
4	Engr
6	CIC
20	

<u>Input Requirements</u> (e), (f), (g), (h)

(h) Tow forces on ship
Towed sonar array
Towed ship
Integrate with wind, current, depth of water
Also tow own ship; i.e., ship being towed performance wind, current rudder, use same data as (9)

<u>Computer Requirement</u>

Add to software from Ship Motion Computer Simulator Configuration 37.
Use Computer #5

<u>Instructor Station</u>

Provide necessary tow/selection
Problem selection

<u>Cost Summary</u> for (h)	<u>Procure</u>	<u>Reference</u>
Tow data on ships		
Software (see Input)		
Tow data array	30K	
Tow forces	10K	Small Boat
Instructor software	10K	
	50K	

+Simulator Configuration 11 for operation

SIMULATOR CONFIGURATION 13

EQUIPMENT CONFIGURATION 3 Bridge

<u>Number of Scenarios</u>	1 Ref. 38
Average manpower per scenario	4 Bridge 1 CIC 2 Engr 7 Total

<u>Input Requirements</u> (e), (f), (g)

(i) Steer with engines - various rudder failures

<u>Computer Requirement</u>

Engine response various rudder conditions, ship maneuver for various engine/depth/rudder conditions

Use Ship Motion Computer (4)

<u>Instructor Station</u>

Provide communications
Provide engine room response
Insert failures

<u>Cost Summary</u> for (i)	**Procure**	**Reference**
Data on Engine Steer	10K	
Software	40K	
	50K	

+Simulator Configuration 11 for operation.

SIMULATOR CONFIGURATION 14

EQUIPMENT CONFIGURATION 3 Bridge + Visual

Number of Scenarios	13 Ref. 33, 34, 39, 40, 43, 47	
Average manpower per scenario	4 Bridge 2 Nav 7 CIC 7 Engr. 20 People	20 Training 15 Enlisted not trained

Input Requirements (e), (f), (g)

(j) Add visual - night - navigation
100° Field of View
Night Navigation gaming area

Computer Requirement

Software for navigation
DMHC data base manipulation for visual as well as radar

Buy CPU #8

Instructor Station

Select gaming area Nav

Cost Summary for (j)	**Procure**	**Reference**
I/O Software Interface	20.0K	
(8) CGI Computer	30.0K	Small Boat
Software (I/O Radar Nav)	100.0K	
1 Projector	17.0K	
Wide Angle Screen	5.0K	
Hardware	153.0K	
	325.0K	

+Simulator Configuration 11 for operation

SIMULATOR CONFIGURATION 14A

EQUIPMENT CONFIGURATION 3

Number of Scenarios None

Average manpower per scenario

See 14 20 people full mission

Input Requirements (e), (f), (g), (i), (j)

Computer Requirement

Use CPU

Instructor Station

None
Failed Rudder - Steer Engine Scenarios with visual
Failed Engine - out of 2

Cost Summary for integration	**Procure**	**Reference**
Ship Data on Failed Ops	20.0K	
Nav Failure Software Motion	50.0K	
Instructor Software	10.0K	
	80.0K	

Simulator Configuration 14 + (i) cost from 13.

SIMULATOR CONFIGURATION	15
EQUIPMENT CONFIGURATION	3 Bridge + Expand Visual

<u>Number of Scenarios</u> — 15 Ref. 25, 49, 50, 54, 55, 56, 57

Average manpower per scenario

4 Bridge
1 Nav
1 Comm
2 Engr.
2 CIC
11 People Total

<u>Input Requirements</u> — (e), (f), (g), (j)

(k) Add ship in field of view — No day visual
Close in view
Ship block light outline

<u>Computer Requirement</u>

Project side view

CPU #9 - Add 24MB disk to dual visual computer system (8) (9)

<u>Instructor Station</u>

Instructor control: Ship, wind, current, other ship.

Additional Data: CPA, TCPA

<u>Cost Summary</u> for (k)

	Procure	Reference
Add Screen	5.0K	
Add projector + 50° Port Side	17.0K	
Added software/hardware for side view	140.0K	
Programs for Ship Block Light, etc.	30.0K	
(9) Add CPU #(9)	30.0K	
24MB Disk	21.0K	
Instructor Station Video term.	3.5K	
Software	20.0K	
	266.5K	

+Simulator Configuration 14A for operation

SIMULATOR CONFIGURATION 16

EQUIPMENT CONFIGURATION 3 Bridge

Number of Scenarios 2 Ref. 41

Average manpower per scenario 38 People

4 Bridge	22 Deck and Enlisted
2 Nav	not trainined in Sim.
10 CIC	
16 People	

Input Requirements (e), (f), (g), (j)

(l) Add anchor forces on ship

Computer Requirement

Expand ship motion equation, use Ship Motion Computer

Instructor Station

Cost Summary for (l)	Procure	Reference
Instructor Software	10.0K	
Ship Trial Data Anchor Forces	10.0K	
Algorithm Definition Anchor	10.0K	
Algorithm Coding	10.0K	
	40.0K	

+Simulator Configuration 14 for operation

SIMULATOR CONFIGURATION	17
EQUIPMENT CONFIGURATION	3 Bridge

<u>Number of Scenarios</u> 3 Ref. 44

Average manpower per scenario	4 Bridge	27 Deck & Enlisted not trained in simulator
	1 Nav	
	1 Comm	
	2 Engr	
	2 CIC	
	11 People	

<u>Input Requirements</u> (e), (f), (g), (j), (k)

(m) Dock
Mooring -- Forces

Dock Scene -- Proximity

<u>Computer Requirement</u>

Add hydrodynamic forces, dock, shallow
Add mooring line forces
Add dock scene (data base)

Use Bridge Simulator Configuration #10 Computer

<u>Instructor Station</u>

Respond to communication

<u>Cost Summary</u> for (m)

	Procure	Reference
Ship Data Dock Forces	10.0K	
Algorithm Definitions	10.0K	
New Software	130.0K	
Communications	20.0K	
Instructor Software	10.0K	
	180.0K	

+Simulator Configuration 15 for operation

SIMULATOR CONFIGURATION 18

EQUIPMENT CONFIGURATION 3 Bridge

Number of Scenarios	2 Ref. 52	
Average manpower per scenario	4 Bridge 1 Nav 1 Comm 2 Engr 2 CIC 11 People	27 Deck and Enlisted not trained

Input Requirements (e), (f), (g), (j), (k)

(n) Helo in visual - correlate with surface and air radar and IFF

Computer Requirement

Helo equation of motion

Add data: relative position
rate of closure

CPU (5)-(6)-(7)-(8)-(9) Totally integrated correlated radar/visual

Instructor Station

Control of helo for landing and takeoff - support communications

Instructor

Cost Summary for (n)	Procure	Reference
New Software Visual	30.0K	
Instructor Software	20.0K	
	50.0K	

+Simulator Configuration 15 for operation

SIMULATOR CONFIGURATION	18A
EQUIPMENT CONFIGURATION	3 Bridge Summary
Number of Scenarios	52 Ref. Simulator Configuration 8 to 18
Average manpower per scenario	(4)
Input Requirements	(e) to (n)
Computer Requirement	None

8 & 9 Visual
5 Instructor Master
6 Control Program Ship
7 Motion Equations

Instructor Station	1 instructor

Cost Summary for Integration	Procure	Reference
Software Organization	20.0K	

Sum of (e) to (n) inputs Cost + Integration of 11, 14A
Use (f) of 9A

SIMULATOR CONFIGURATION 18B

EQUIPMENT CONFIGURATION 3

Number of Scenarios 2 Ref. 46 (See Simulator #12)

Average manpower per scenario Same as 18 Small Crew

Input Requirements (e), (f), (g), (h), (j)

Computer Requirement

Visual for ship to be towed CPU #6

Instructor Station

SAR Problem to V

Control Problem CPU #4

Cost Summary	Procure	Reference
Added Night Visual (ship)	30.0K	
Expand Instruction	10.0K	
	40.0K	

Configuration #12 (j)

SIMULATOR CONFIGURATION 19

EQUIPMENT CONFIGURATION 1, 3 Bridge/CIC

Number of Scenarios 7 Ref. 42, 51, 65

Average manpower per scenario 16 Total — 27 Deck and Enlisted not trained

4	Bridge
12	CIC
16	Total

Input Requirements (a), (g), (j), (k)

Computer Requirement

I/O between Bridge/CIC procedure trainer

Instructor Station

One Master, 1 Slave (two instructor operation)
New scenarios for combined operations

Cost Summary for Integration	Procure	Reference
New Hardware I/O	15.0K	CPU 4, 5, 6, 7 to 1, 2, 3
New Programs	10.0K	
Install Old Programs	5.0K	
	30.0K	

+Simulator Configuration 7 & 15 for operation

SIMULATOR CONFIGURATION	20
EQUIPMENT CONFIGURATION	1, 3

Number of Scenarios 8 Ref. 33, 40, 43

Average manpower per scenario 4 Bridge
12 CIC
16 Total

Input Requirements (a) to (g) + (j)

Computer Requirement

None

Instructor Station

Instructor Provide Engr. Inputs
Nav Inputs
Comm Inputs

Cost Summary for Integrate*	**Procure**	**Reference**
Software for Correlate Radar Vis		
Instructor Software	10.0K	
I/O 1,2,3,4,8-9	15.0K	2, 3 to 4, 5, 6

+Simulator Configuration 7 & 14A to operate

*See 19

SIMULATOR CONFIGURATION	21	
EQUIPMENT CONFIGURATION	1,3	
Number of Scenarios	66 Ref. 2,3,5,6,6A,7,8,25,35,54,55,56,57	
Average manpower per scenario	4 Bridge 12 CIC 16 Total	27 Not trained Deck and Enlisted

Input Requirements (a) to (g) + (j), (k)

Computer Requirement

1 Surface	----	1 Surface
2 Shipmotion	----	2 Ship Radar
3 Air	----	3 Air Radar
4 Shipmotion	----	4 Instructor
5 Shipmotion	----	5 Target Control
6,7 Visual	----	Visual

Instructor Station

Instructor provide external inputs

Cost Summary	Procure	Reference
Reorganize Software	20.0K	
Instructor Programs	20.0K	
	40.0K	

+Simulator Configuration 19 to operate

SIMULATOR CONFIGURATION 22

EQUIPMENT CONFIGURATION 1,3

Number of Scenarios 2 Ref. 41

Average manpower per scenario	4 Bridge
	12 CIC
	16 Total

Input Requirements (a) to (g) + (j), (k)

Computer Requirement

None

Instructor Station

None - Instructor provide external inputs

Cost Summary	Procure	Reference
Correlate Rad/Visual Instructor	10.0K	

+Simulator Configuration #7 & #16 to operate.

SIMULATOR CONFIGURATION 23

EQUIPMENT CONFIGURATION 1,3

Number of Scenarios 2 Ref. 52

Average manpower per scenario	4 Bridge
	12 CIC
	16 Total

Input Requirements (a) to (g) + (j), (k), (n)

Computer Requirement

None

Instructor Station

Instructor provide external inputs

Cost Summary	Procure	Reference
Instructor	10.0K	
I/O 1-2-3-8-9 5-6-7	15.0K	
	25.0K	

+Simulator Configuration 7 & 18 to operate

SIMULATOR CONFIGURATION 23A

EQUIPMENT CONFIGURATION 1,3

Number of Scenarios 2 Ref. 41

Average manpower per scenario	4 Bridge
	12 CIC
	16 Total

Input Requirements (a) to (g) + (j), (1)

Computer Requirement

123,456

Instructor Station

Control Problem from 4
Anchor Problem

Cost Summary	**Procure**	**Reference**
Reorganize Software	20.0K	
Instructor Programs	20.0K	
I/O	10.0K	
I/O Software	10.0K	
	60.0K	

Simulator Configuration 22

SIMULATOR CONFIGURATION 23B

EQUIPMENT CONFIGURATION 1,3

Number of Scenarios 3 Ref 44

Average manpower per scenario 4 Bridge
12 CIC
16 People

Input Requirements (a) to (g) + (j), (k), (m)

Computer Requirement

Instructor Station

Docking Problem

Cost Summary	Procure	Reference
Reorganize Software	20.0K	
Instructor Programs	20.0K	
I/O Hardware	10.0K	
I/O Software	10.0K	
	60.0K	

Simulator Configuration 7 & 17

SIMULATOR CONFIGURATION 23C

EQUIPMENT CONFIGURATION 1, 2, 3

Number of Scenarios	2 Ref. 46
Average manpower per scenario	4 Bridge
	12 CIC
	16 People
Input Requirements	(a) to (g) + (h), (j), (k)

Computer Requirement

Instructor Station

SAR - Tow Problem

Cost Summary	Procure	Reference
Reorganize Software	20.0K	
Instructor Programs	20.0K	
I/O	10.0K	
I/O Software	10.0K	
	60.0K	

Simulator Configuration 7 and 18B

SIMULATOR CONFIGURATION 23D

EQUIPMENT CONFIGURATION 1, 2, 3

Number of Scenarios 76

Average manpower per scenario 16

4 Bridge
12 CIC
16 People

Input Requirements (a) to (n)

Computer Requirement

Correlate Visual/Radar, Surface & Air, Targets & Nav

Instructor Station 2 Instructors; 1 operate, one respond

Respond for other Departments as required
Engineering, Nav, Comm

Cost Summary	**Procure**	**Reference**
Reorganize Software	20.0K	
Instructor Programs	20.0K	
I/O Hardware	10.0K	1 to 4 to 5-9 CPU sets
I/O Software	10.0K	

+Simulator Configuration 7 & 18A to operate

SIMULATOR CONFIGURATION	24
EQUIPMENT CONFIGURATION	4 Communication Mockup
Number of Scenarios	11 Ref. 4 & 19
Average manpower per scenario	5 People in Comm

Input Requirements (o)

Voice, CW, Tactical signals
CIC, AAW, ASW radio circuits

Computer Requirement

Tactical network responses

Instructor Station

Instructor respond for all scenario selection—network setup/operation under automatic control

Cost Summary for (o)	Procure	Reference
(Hardware Configuration 4)		
Communications Plannel	40.0K	
Instructor Panel	10.0K	
	50.0K	

SIMULATOR CONFIGURATION 25

EQUIPMENT CONFIGURATION 4 Communications

Number of Scenarios 6 Ref. 10

Average manpower per scénario 1 Enlisted

Input Requirements (p)

Navy Communications System

Computer Requirement

CPU + I/O for Instructor

CPU, core based system
10M byte disk 13.8

Instructor Station

Instructor response to all inputs

Cost Summary for (p)

	Procure	Reference
Comm Front-End VTAM	10.0K	
CPU #10	30.0K	
Peripheral	13.8K	
Special Hardware	10.0K	
Programs	25.0K	
Instructor Console	3.5K	
	92.3K	

+Simulator Configuration 24 to operate

SIMULATOR CONFIGURATION	26
EQUIPMENT CONFIGURATION	4 Communications

Number of Scenarios 1 Ref 11

Average manpower per scenario 1 Enlisted

Input Requirements (q)

Computer Requirement

Instructor Station

Instructor repond to all inputs

Cost Summary for (q)	Procure	Reference
New Format & Check Program	5.0K	

+Simulator Configuration 25 to operate

SIMULATOR CONFIGURATION	27
EQUIPMENT CONFIGURATION	4 Communications

<u>Number of Scenarios</u> 1 Ref. 12

Average manpower per scenario 2 Enlisted

<u>Input Requirements</u> (o),(p),(q)

<u>Computer Requirement</u>

None

<u>Instructor Station</u>

None

<u>Cost Summary</u> for Integration	<u>Procure</u>	<u>Reference</u>
Software Instructor	10.0K	

+Simulator Configuration 26 to operate

SIMULATOR CONFIGURATION 28

EQUIPMENT CONFIGURATION 4 Communications

Number of Scenarios 4 Ref. 14 and 18

Average manpower per scenario 2 Enlisted

Input Requirements (r)

TTY Data

Computer Requirement

Generate TTY messages
Check incoming (from Comm) necessary error/formats, etc.
Use CPU #10

Instructor Station

Select scenario, respond to communications

Cost Summary for (r)	Procure	Reference
TTY	2.0K	
Check & Generate Programs	5.0K	
	7.0K	

+Simulator Configuration 27 to operate

SIMULATOR CONFIGURATION 29

EQUIPMENT CONFIGURATION 4 Communications

Number of Scenarios 2 Ref. 23

Average manpower per scenario 2 Enlisted

Input Requirements (o), (p), (q), (r)

Computer Requirement

None

Instructor Station

None

Cost Summary for integration	Procure	Reference
Software	10.0K	

+Simulator Configuration 28 to operate

SIMULATOR CONFIGURATION 30

EQUIPMENT CONFIGURATION 4 Communications

Number of Scenarios 2 Ref. 72

Average manpower per scenario 2 Enlisted

Input Requirements (s)

Sound powered phone 2-way

Computer Requirement

None

Instructor Station

Respond to and monitor all communications

Cost Summary for (s)	Procure	Reference
Hardware Comm	10.0K	
Instructor	5.0K	
	15.0K	

+Simulator Configuration 29 to operate

SIMULATOR CONFIGURATION 31

EQUIPMENT CONFIGURATION 4 Communications

Number of Scenarios 17 Ref. 5, 6, 15, 16, 39, 58

Average manpower per scenario 2 Enlisted

Input Requirements (o) to (s)

Computer Requirement

None

Instructor Station

None

Cost Summary for integration	Procure	Reference
Reorganize Software	10.0K	
Reorganize Instructor	10.0K	
	20.0K	

+Simulator Configuration 30 to Operate

SIMULATOR CONFIGURATION	31A
EQUIPMENT CONFIGURATION	4 Communication (Secure)

<u>Number of Scenarios</u> 6 Ref. 13, 17
38 for 24 to 31A Configurations

Average manpower per scenario 5
2 Enlisted Secure
2 Enlisted Regular Com
1 Officer

<u>Input Requirements</u> (o) to (s) + Encription

<u>Computer Requirement</u>

Use CPU #10

<u>Instructor Station</u> 1 instructor

<u>Cost Summary</u> for integration	Procure	Reference
Additional Coding for secure Multiple Channels	25.0K	

+Simulator Configuration 31

SIMULATOR CONFIGURATION 32

EQUIPMENT CONFIGURATION 3,4 Bridge Comm

Number of Scenarios 24 Ref. 4, 42, 65, 39, 54, 55, 56, 25

Average Manpower per scenario 4 Bridge
2 Comm
6 People

Input Requirements (e), (f), (g), (j), (k), (n), and (o) to (s

Computer Requirement

I/O Comm

Instructor Station

Expand for Comm/Bridge operation (has radar)
CPU 4 Control Problem - Use 8 for Comm

Cost Summary for integration	Procure	Reference
I/O	15.0K	CPU 10 to CPU 5. 6. 7. 8. 9
New Software	10.0K	
	25.0K	

+Simulator Configuration 31 and Simulation Configuration 18

SIMULATOR CONFIGURATION	32A
EQUIPMENT CONFIGURATION	3,4

Number of Scenarios	2 Ref. 52
Average manpower per scenario	4 Bridge
	5 Comm
	9 Total

Input Requirements (e), (f), (g), (j), (k), (n) + (o) to (s)

Computer Requirement

Helo in Visual & on Radar

Instructor Station

Instructor support coordinated & Start with Comm.

Cost Summary	Procure	Reference
Simulator Configuration 32		
Instructor	10.0K	

+Simulator Configuration to operate

SIMULATOR CONFIGURATION 32B

EQUIPMENT CONFIGURATION 3, 4 Bridge/Comm

Number of Scenarios 12 Ref.

Average manpower per scenario 9

4 Bridge
5 Communications
9 Total

Input Requirements (e) to (s)

Computer Requirement

Instructor Station 1 Instructor

CPU 5 Control Problem (Instructor Station)

Cost Summary for integration	**Procure**	**Reference**
I/O Hardware	15.0K	CPU 10 to CPU 5, 6, 7, 8, 9
Organize Software	10.0K	
	25.0K	

+Simulator Configuration 18A & 31A to operate

SIMULATOR CONFIGURATION	33
EQUIPMENT CONFIGURATION	1,4 CIC/Comm

<u>Number of Scenarios</u>	15 Ref. 6A, 7, 8
Average manpower per scenario	12 CIC 5 Comm 17 Total

<u>Input Requirements</u>	(a) to (d) and (o) to (s)

<u>Computer Requirement</u>

I/O CIC/Bridge

<u>Instructor Station</u>

Expand for CIC/Bridge operation

<u>Cost Summary</u> for integration	<u>Procure</u>	<u>Reference</u>
I/O	15.0K	CPU 10 to CPU 1, 2, 3, 4
New Software	10.0K	
	25.0K	

+Simulator Configuration 7 & 31 to operate

SIMULATOR CONFIGURATION 33A

EQUIPMENT CONFIGURATION 1, 2, 4

Number of Scenarios 15

Average Manpower per Scenario 17

12	CIC
5	Comm
17	Total

Input Requirements (a) to (d) & (o) to (s)

Computer Requirement

Instructor Station 2 Instructors; 1 control problem, 1 respond

Cost Summary	Procure	Reference
I/O Hardware	15.0K	CPU 10 to CPU 1, 2, 3, 4
New Software	10.0K	
	25.0K	

SIMULATOR CONFIGURATION 34

EQUIPMENT CONFIGURATION 1, 2, 3, 4, CIC/Bridge/Comm

Number of Scenarios	15 Ref. 42, 51, 65
Average manpower per scenario	4 Bridge
	12 CIC
	5 Comm
	21

Input Requirements (a) to (g), (j), (k), + (o) to (s)

Computer Requirement

I/O Comm, CIC, (has radar) Bridge (has radar - do not include in $)

Instructor Station

Expand operation scenario selection

Cost Summary for integration	Procure		Reference
I/O	15.0K	Integrate CPU	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
New Software	10.0K		
	25.0K		

+Simulator Configuration 31 and 19 to operate

SIMULATOR CONFIGURATION	34A
EQUIPMENT CONFIGURATION	1, 2, 3, 4

Number of Scenarios 29

Average Manpower per Scenario 21

4	Bridge
5	Comm
12	CIC
21	Total

Input Requirements (a) to (n)

Computer Requirement

Instructor Station 2 Instructors; 1 control problem
1 respond

Cost Summary

	Procure	Reference
I/O Hardware	15.0K	CPU #1-10
Organize Software	10.0K	
	25.0K	

+Simulator Configurations 23C & 32B to operate

SIMULATOR CONFIGURATION	35	
EQUIPMENT CONFIGURATION	5 Engr	

Number of Scenarios 9 Ref. 32, 35, 66, 70, 71, 73, 74

Average manpower per scenario 4 in Engr.

Input Requirements (u)

Power control panel similar to LCOT as required for procedures training.

Computer Requirement

CPU to program operation, selected failures
Instructor console etc.
Peripherals - 10 M byte disk

Instructor Station

Instructor set in failures
Respond to communications

Cost Summary for (u)

	Procure	Reference
Panel Mockup	50.0K	MITAGS
Hardware Development	100.0K	
(11) CPU	30.0K	AII
Peripheral	13.8K	Singer
Software	120.0K	
Instructor Station	3.5K	
Instructor Software	75.0K	
	392.3K	

SIMULATOR CONFIGURATION 37

EQUIPMENT CONFIGURATION 7 Engine Room Contrcl Gas Turbine

Number of Scenarios 15 Package (c)

4 Engr.

Input Requirements (w)

Engine room control simulator

Computer Requirement

Use CPU 9 or 10 consider add stand alone?
Only use either diesel or gas turbine not both

Instructor Station

Program failures
Respond to communications

Cost Summary for (w)	Procure	Reference
Panel Mockup	50.0K	
Hardware Development	100.0K	
CPU (128K)	45.0K	
Peripheral	13.8K	
Software	150.0K	
Instructor Software	45.0K	
Instructor Console	3.5K	
	407.3K	

*Simulator Configuration 35 to operate

SIMULATOR CONFIGURATION 36

EQUIPMENT CONFIGURATION 6 Engine Room Diesel

Number of Scenarios 13 Ref. Package (b)

Average manpower per scenario 4 Engr. Console

Input Requirements (v)

Diesel control panel similar to MITAGS engine room for steam

Computer Requirement

CPU to set up engine operation, response program failures drive indictors and for instructor console.

Instructor Station

Program in the failures
Respond to the communication

Cost Summary (v)	Procure	Reference
Panel Mockup	50.0K	
Hardware Dev.	100.0K	MITAGS 767
CPU (128K)	45.0K	AII 720-1.2
Peripheral	13.8K	
Software	150.0K	Singer
Instructor Software	45.0K	
Instructor Console	3.5K	
	407.3K	

+Simulator Configuration 35 to operate

SIMULATOR CONFIGURATION 37A

EQUIPMENT CONFIGURATION 5, 6, 7, Engr & Diesel, Turbine

Number of Scenarios

Average manpower per scenario 8 Engr.

4 Engineering
4 Engine (Diesel or Turbine)
8

Input Requirements (u), (v), (w)

Computer Requirement

Instructor Station 1 instructor

Cost Summary	Procure	Reference
I/O CPU 11, 12, 13	15.0K	
I/O Software	25.0K	
	40.0K	

+Simulator Configurations (u), (v), (w)

SIMULATOR CONFIGURATION 38

EQUIPMENT CONFIGURATION 3,5,6,7

Number of Scenarios 14 Ref. 33,34,36,37,38

Average manpower per scenario	4 Bridge
	4 Engr
	4 Engine
	12 Total

Input Requirements (e), (f), (g), (i), (j) and (u), (v), (w)

Computer Requirement

I/O Bridge Engine Room

Instructor Station

Coordinated Bridge Engine Room, Engineering

Cost Summary for integration	**Procure**	**Reference**
I/O	15.0K	CPU 4, 5, 6, 7, to CPU 9 & 10
New Software	10.0K	
	25.0K	

+Simulator Configuration 36, 37 and 14A for operation
Expanded Visual

SIMULATOR CONFIGURATION 38A

EQUIPMENT CONFIGURATION 3, 5, 6, 7

Number of Scenarios 3 Ref. 44

Average manpower per scenario
4 Engr
4 Bridge
4 Engine
12 Total

Input Requirements (e), (f), (g), (j), (m), (u), (v), (w)

Docking Problem

Computer Requirement

Instructor Station

Cost Summary	Procure	Reference
I/O	15.0K	
I/O Software	10.0K	
	25.0K	

Simulator Configuration 38 + (m) cost from 17.

SIMULATOR CONFIGURATION 38B

EQUIPMENT CONFIGURATION 3, 5, 6, 7

Number of Scenarios	2 Ref. 56
Average manpower per scenario	4 Bridge 4 Engr 4 Engine 12 Total
Input Requirements	(e), (f), (g), (j), (k), (u), (v), (w)

Ship in FOV - replentishment transfer

Computer Requirement

Instructor Station

Cost Summary	Procure	Reference
I/O Hardware	15.0K	
I/O Software	10.0K	
Instructor	10.0K	
	35.0K	

+Simulator Configuration 38 + (k) cost to operate

SIMULATOR CONFIGURATION 38C

EQUIPMENT CONFIGURATION 3, 5, 6, 7

Number of Scenarios 14

Average manpower per scenario 12

4 Bridge
4 Engineering
4 Engine (Diesel or Turbine)
12 Total

Input Requirements (e) to (n) & (u) to (w)

Computer Requirement

Instructor Station 2 Instructors; 1 controls problem
1 respond

Cost Summary	Procure	Reference
I/O Hardware	15.0K	
I/O Software	10.0K	
Instructor Software	10.0K	
	35.0K	

+Simulator Configuration 18A & 37A to operate

SIMULATOR CONFIGURATION 39

EQUIPMENT CONFIGURATION 8 ASW

Number of Scenarios 2 Ref. A1, A2

Average manpower per scenario 4 People CIC-ASW

Input Requirements (x)

Multiple shire response plot all multiple hydrodynamic playing areas

Computer Requirement

CPU for bathemetry
Peripheral - 10 M byte disk 13.8

Instructor Station

Control ships - internal/external communications

Cost Summary for (x)	Procure	Reference
Mockup	125.0K	Hughes
BT Traces, etc. Software	100.0K	
Engine on Ship Surface/Sub surface	50.0K	AAI
CPU + I/O 128K (14)	45.0K	Raytheon
Instructor Console	3.5K	
Instructor Software	50.0K	
Peripherals	13.8K	
Hardware Design	100.0K	
	487.3K	

SIMULATOR CONFIGURATION 40

EQUIPMENT CONFIGURATION 8 ASW

Number of Scenarios 4 Ref. A3

Average manpower per scenario 4 People CIC

Input Requirements (x) + (y)

(y) Procedures
Target Plots

Computer Requirement

Use CPU 12
Target Generator (Multiple)
Surface)
Subsurface) 12 Targets total
Weapons Response)

Instructor Station

Respond to communications
Set up single ship response
Control target sub
Respond for Weaspons Systems

Cost Summary for (y)	Procure	Reference
Target Software	360.0K	
Added Hardware	80.0K	21A38
Instructor Software	120.0K	21A40
	560.0K	AAI
		12Target + ASW only

+Simulator Configuration 39 & 7 to operate

SIMULATOR CONFIGURATION	41
EQUIPMENT CONFIGURATION	8 ASW
<u>**Number of Scenarios**</u>	11 Ref. A4, A5, A6
Average manpower per scenario	4 CIC

<u>Input Requirements</u> (x), (y) Expand Instructor

Coordinate with Weapon System

<u>Computer Requirement</u>

None - Use CPU 12

<u>Instructor Station</u>

Control target sub, respond for weapons system

<u>**Cost Summary**</u> for operation 1	<u>**Procure**</u>	<u>**Reference**</u>
Weapons Game Programs	10.0K	
See if Hit scores		
+Simulator Configuration 40 to operate		

SIMULATOR CONFIGURATION 41A

EQUIPMENT CONFIGURATION 8

Number of Scenarios 2 Ref. A7

Average manpower per scenario 4 CIC

Input Requirements (x), (y) + Operation 1

Computer Requirement

Use CPU #11

Instructor Station

Target multivehicle track & control

Cost Summary	Procure	Reference
Multiple target tracks Instructor Control	10.0K	

+Simulator Configuration 41

SIMULATOR CONFIGURATION 41B

EQUIPMENT CONFIGURATION 8

Number of Scenarios 4 Ref. A8, A9

Average manpower per scenario 4 CIC ASW

Input Requirements (x), (y)

Computer Requirement

Use CPU #14

Instructor Station 1 instructor

Instructor need weapon game system

Cost Summary	**Procure**	**Reference**
Game Software	10.0K	

Simulator Configuration 41A to operate*

SIMULATOR CONFIGURATION	**42**
EQUIPMENT CONFIGURATION	1,8 CIC-ASW

<u>Number of Scenarios</u>	18 Ref. A11 to A17
Average manpower per scenario	12 CIC
	4 ASW
	16 Total

<u>Input Requirements</u> (a) to (d) + (x) & (y)

Multiple ship responses

<u>Computer Requirement</u>

General multiple targets - Use CPU #11

<u>Instructor Station</u> 2 Instructors, One Control Problem
One Control Targets

Target and multi-vehicle track and control
Respond to multi-ship and intership communications
CPU #11 Drive CPU Target Generator CPU 1 and 3

<u>Cost Summary</u>	**<u>Procure</u>**	**<u>Reference</u>**
I/O 123-8	15.0K	
I/O Software	15.0K	
Multiple Target to Surface Search Air Search under Instructor Control	40.0K	
	70.0K	

+Simulator Configuration 7 & 41B to operate

SIMULATOR CONFIGURATION 43

EQUIPMENT CONFIGURATION 1,2,3,8

Number of Scenarios	30 Ref. A4, A5, A6, A8, A11 to A17
Average manpower per scenario	12 CIC
	4 CIC ASW
	4 Bridge
	20 Total

Input Requirements (a) to (g) + (j) (k)

Computer Requirement

None

Instructor Station

None - Some Procedural
- Same as 1,3

Cost Summary for integration	Procure	Reference
Instructor	20.0K	
I/O	10.0K	CPU 1,2,3,4 CIC
Software	50.0K	CPU 5,6,7,8,9 Bridge
	80.0K	to CPU 14 ASW

+Simulator Configuration 19 + 41B

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A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY--ETC(U)
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UNCLASSIFIED 3M080 USCG-C-1-77 NL

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SIMULATOR CONFIGURATION	43A
EQUIPMENT CONFIGURATION	1, 2, 3, 8

Number of Scenarios 29

Average manpower per scenario 20

12	CIC
4	ASW
4	Bridge
20	Total

Input Requirements (a) to (n) & (x), (y)

Computer Requirement

Instructor Station 2 Instructors; 1 control problem
1 control targets

Cost Summary to integrate	**Procure**	**Reference**
Instructor Software	20.0K	
I/O Hardware	10.0K	
Reorganize Software	50.0K	
	80.0K	

+Simulator Configuration 7, 42, 18A to operate.

SIMULATOR CONFIGURATION	44
EQUIPMENT CONFIGURATION	1,3,8

Number of Scenarios 18

Average manpower per scenario
4 ASW
12 CIC
4 Bridge
20 Total

Input Requirements (a) to (g) + (j), (k), + (o) to (s) + (x), (y)

Computer Requirement

None - Potential I/O for Multi-threat
Multi-Sensor
Use CPU #11

Instructor Station

None

Cost Summary for integration	Procure	Reference
Common Target Program Air Search, Surface & Sonar Track of Multi-threat	50.0K	

+Simulator configuration 43

SIMULATOR CONFIGURATION 44A

EQUIPMENT CONFIGURATION 1, 2, 3, 4, 8

Number of Scenarios 18

Average manpower per scenario 20

4	ASW
12	CIC
4	Bridge
20	Total

Input Requirements (a) to (s) + (x), (y)

Computer Requirement

Simulator Configurations 1, 2, 3, 4 have been integrated. See 34A

Instructor Station 2 Instructors; 1 control problem
1 control weapons game, targets, etc.

Cost Summary	**Procure**	**Reference**
Common Target Programs Air/Surface/Sonar	50.0K	
	50.0K	

+Simulator Configuration 7, 18A, 31 & 42 to operate

SIMULATOR CONFIGURATION 45

EQUIPMENT CONFIGURATION 9

Number of Scenarios 4 Ref 9

Average manpower per scenario 2

Input Requirements (z)

Secure Data

Computer Requirement

Generate and decode signal (Radiometric Signatures)
Use Communication CPU #13

Instructor Station 1 instructor

Scenarios, responses, etc.
Generate multiple tracks with radiometric signature under instructor control.
Peripheral 10M byte disk 13.8

Cost Summary for (z)	Procure	Reference
CPU (12)	45.0K	(7 target signature at 20K each
Software	140.0K	
Peripheral	13.8K	
I/O	5.0K	SENT (AAI)
Mockup	82.0K	300 + 500K
Hardware Design	50.0K	
Instructor Control	3.5K	
Instructor Software	45.0K	
	384.3K	

SIMULATOR CONFIGURATION 46

EQUIPMENT CONFIGURATION 1,2,3,9

Number of Scenarios 4

Average manpower per scenario	9 CIC
	4 AAW
	2 EW
	4 Bridge
	19 Total

Input Requirements (a) to (g) + (j), (k) + (z)

None

Computer Requirement

None

Instructor Station

No I/O Bridge, CIC, Comm talk direct
Interact Direct

Cost Summary for integration	**Procure**	**Reference**
I/O CPU 12 to		
123&4567	20.0K	
Instructor	20.0K	
I/O Programs to Drive		
Target Generator	20.0K	
	60.0K	

+Configurations 34 & 45 to operate

SIMULATOR CONFIGURATION	46A
EQUIPMENT CONFIGURATION	1,2,3,4,8,9

<u>Number of Scenarios</u>	4 Ref. 9
Average manpower per scenario	9 CIC
	4 ASW
	2 EW
	4 Bridge
	2 Comm
	21 Total

<u>Input Requirements</u> (a) to (g), + (j), (k) + (o) to (s) + (x) to (z)

<u>Computer Requirement</u>

<u>Instructor Station</u>

CPU #13 is Instructor Master for problems

<u>Cost Summary</u> for integration	**Procure**	**Reference**
Instructor	20.0K	
I/O Hardware 12 to CPU 8 & 11	20.0K	
I/O Software	20.0K	
	60.0K	

+Simulator Configuration 45 & 31A

SIMULATOR CONFIGURATION 46B

EQUIPMENT CONFIGURATION 1, 2, 3, 8, 9

Number of Scenarios 4

Average manpower per scenario 19

9	CIC
4	ASW
2	EW
4	Bridge
19	Total

Input Requirements (a) to (n) (x) to (z)

Computer Requirement

Instructor Station 2 Instructors; 1 control/respond
1 weapons, targets

Cost Summary

	Procure	Reference
Instructor Software	20.0K	
I/O Hardware	20.0K	
I/O Software	20.0K	
	60.0K	

+Simulator Configurations 7, 18A, 45 to operate

SIMULATOR CONFIGURATION 46C

EQUIPMENT CONFIGURATION 1, 2, 3, 4, 8, 9

Number of Scenarios 4

Average manpower per scenario 21

9 CIC
4 ASW
2 EW
4 Bridge
2 Comm
21 Total

Input Requirements

(a) to (s) & (x) to (z)

Computer Requirement

Equipment Configurations 1, 2, 3, 4 Integrated. See 34A
8 or 9 have worked with CIC

Instructor Station

2 Instructors; 1 to control/respond
1 weapons/targets

Cost Summary

	Procure	Reference
Instructor Software	20.0K	
I/O Hardware	20.0K	
I/O Software	20.0K	
	60.0K	

+Simulator Configuration 7, 19A, 41B, 45 to operate

SIMULATOR CONFIGURATION 47

EQUIPMENT CONFIGURATION 10 Navigation

Number of Scenarios 20 Ref. 2, 6, 58, 37

Average manpower per scenario 2 Nav

Input Requirements (t)

Visual sighting system + Electronics for LORAN, Direction Finding to match the scenario - Satellite Nav probably added. Simulated inputs, no real equipments.

Computer Requirement

CPU to generate Nav Signals 13
Peripheral 10 M Byte Disk 13.8

Instructor Station 1 instructor

Instructor to select scenario
Set in navigation data base

Cost Summary for (t) periph.	Procure	Reference
(16) CPU for Nav	13.8K	
Mockup navigation charts, etc.	25.0K	
Computer programs for electronic aids	10.0K	
Instructors Console	20.0K	
Mockup of ???? 10	3.5K	
I/O Computer	5.0K	
I/O Special to Recover mockups	5.0K	
	92.3K	

SIMULATOR CONFIGURATION	48
EQUIPMENT CONFIGURATION	1,3,10

Number of Scenarios	19 Ref. 2 etc.
Average manpower per scenario	6 in CIC 4 on Bridge 2 in Nav 12 Total

Input Requirements (a) to (g) +(j), (k) + (t)

Computer Requirement

Interface CPU coordinate with own ship location

Instructor Station

Instructor control of Bridge, CIC, Nav Programs
CPU #12 become Master

Cost Summary for Integration	**Procure**	**Reference**
I/O Hardware	20.0K	CPU #13 to CPU 123 CIC & CPU 4567 Bridge
New Programs	20.0K	
	40.0K	

+Simulator Configuration 19 and 47 to operate

SIMULATOR CONFIGURATION 48A

EQUIPMENT CONFIGURATION 1, 3, 10

Number of Scenarios 2 Ref. 41

Average manpower per scenario	6 CIC
	4 Bridge
	2 Nav
	12 Total

Input Requirements (a) to (g), + (j), (l), (t)

Computer Requirement See 48

123	Nav	Surface	1
456	Bridge	Own Ship	2
13	Nav	Air	3
		Instruct	

Instructor Station

Anchor Nav Support
Control CPU #4

Cost Summary	Procure	Reference
I/O Hardware	20.0K	
I/O Software	20.0K	
Reorganize Prog	20.0K	
Instructor Support	20.0K	
	80.0K	

Simulator Configuration 47 & 23A

SIMULATOR CONFIGURATION 48B

EQUIPMENT CONFIGURATION 1,3,10

Number of Scenarios 3 Ref. 44

Average manpower per scenario	6 CIC
	4 Bridge
	2 Nav
	12 Total

Input Requirements (a) to (g) + (j), (l), (t)

Computer Requirement

See 48A

Instructor Station

Docking

Cost Summary	Procure	Reference
I/O Hardware	20.0K	
I/O Software	20.0K	
Reorganize Programs	20.0K	
Instructor Support	20.0K	
	80.0K	

+Simulator Configurations 47 & 23B

SIMULATOR CONFIGURATION **48C**

EQUIPMENT CONFIGURATION 1,3,10

Number of Scenarios	2 Ref. 46
Average Manpower per Scenario	6 CIC
	4 Bridge
	2 Nav
	12 Total

Input Requirements (a) to (g) + (j), (l), (t)

Computer Requirement

See 48A

Instructor Station

SAR Problem Towing

Cost Summary	Procure	Reference
I/O Hardware	20.0K	
I/O Software	20.0K	
Reorganize Programs	20.0K	
Instructor Support	20.0K	
	80.0K	

Simulator Configurations 47 & 23C

SIMULATOR CONFIGURATION	48D
EQUIPMENT CONFIGURATION	1, 2, 3, 10

<u>Number of Scenarios</u> 20

Average manpower per scenario 18

12 CIC
4 Bridge
2 Nav
20 Total

<u>Input Requirements</u> (a) to (n) + (t)

<u>Computer Requirement</u>

<u>Instructor Station</u> 2 Instructors; 1 control problem
1 respond

<u>Cost Summary</u>	**<u>Procure</u>**	**<u>Reference</u>**
I/O Hardware	20.0K	
I/O Software	20.0K	
Reorganize Programs	20.0K	
Instructor Support	20.0K	
	80.0K	

+Simulator Configurations 7, 18A & 47 to operate

SIMULATOR CONFIGURATION 49

EQUIPMENT CONFIGURATION 1 to 10

<u>Number of Scenarios</u> 47 See Simulator Requirements

Average manpower per scenario	4 Bridge	Deck & Enlisted
	2 Nav	Not Trained
	5 Comm	
	12 Engr	
	18 CIC (Air, Surface, ASW, & W)	
	41 Total	

<u>Input Requirements</u>

<u>Computer Requirement</u>

<u>Instructor Station</u>

Multiple control total problem
Use peripherals previously developed
Do not double load radar into CIC & Bridge

<u>Cost Summary</u> for integration	<u>Procure</u>		<u>Reference</u>	
(17) CPU Master All	25.0K			
CPU I/O	5.0K			
Dual Program Residence	25.0K			
Instructor Programs	100.0K			
Interface Programs	40.0K			
I/O, Controllers, Misc.	20.0K			
	215.0K	CPU #14 to	1,2,3,4	CIC
			5,6,7,8,9	Bridge
			10	Comm
			11,12,13	Engr
			14	ASW
			15	EW
			16	Na

+Simulator Configuration 7, 18A, 31, 31, 36, 37, 41, 45, 47

SIMULATOR CONFIGURATION	**49A**	
EQUIPMENT CONFIGURATION	**1 to 10**	
Number of Scenarios	**47**	
Average manpower per scenario	**41 Total**	**4 Bridge**
		2 Nav
		5 Comm
		12 Engr
		18 CIC, Air, Surface ASW & EW
		41 Total
Input Requirements	**(a) to (z)**	

Computer Requirement

CPU 1, 2, 3, 4 CIC
CPU 4, 5, 6, 7, 8, 9 Bridge
CPU 10 Comm
CPU 12, 13 Engr.
CPU 14 ASW
CPU 15 EW
CPU 17 Nav

Instructor Station	5 Instructors
CPU 17 Master for All -	1 Instructor
	1 Control Air Targets
	1 Control Surface Targets
	1 Control Weapons Games
	1 Provide Instruction to Weakest Dept.

Cost Summary	**Procure**	**Reference**
17 CPU Master for All	25.0K	
CPU I/O	5.0K	
Dual Program Residence	25.0K	
Instructor Programs	100.0K	
Interface Programs	40.0K	
I/O Hardware, Misc.	20.0K	
	215.0K	

+Simulator Configurations 7, 18A, 37A, 47, 41B, 45, 31A to operate

C3.2 SIMULATOR COST FOR HANDS-ON TRAINING

The final step was to develop a probable cost for the hands-on student training hour for each simulator configuration. This is summarized in Table 1. The assumptions used were that the equipment life would be ten years, any simulator would be used on a two-shift basis with maintenance cost the same as amortization of equipment. Thus, both the hourly cost to acquire and maintain are derived by dividing the cost to acquire by 4160 hours/year x 10 years. The instructor cost is based on an officer as the instructor. The average number of students is obtained by averaging the number of students for all the training scenarios to be run in that configuration.

The cost figures for the simulator acquisition is derived from the previous cost analysis charts. Thus, as an example, simulator Configuration 2 (refer to page C-1-6) cost \$40K plus simulator Configuration 1, an additional \$568.5K for a total of \$608.5K.

TABLE C-18. COST SUMMARY - SIMULATOR TRAINING

Simulator Configuration	Cost To Acquire (in thousands)	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
1	568.5	13.66	15.57	13.66	5	7	6.12
2	608.5	14.62	15.57	14.62	12	5	8.96
3	717.0	17.23	15.57	17.23	4	18	2.77
4	747.0	17.95	15.57	17.95	3	16	3.21
5	737.0	17.71	15.57	17.71	26	9	5.66
6	247.3	5.94	15.57	5.94	6	3	9.15
7	1029.3	24.74	15.57	24.74	39	12	5.42
8	220.0	5.28	15.57	5.28	2	4	6.53
9	768.5	18.47	15.57	18.47	2	4	13.12
9A	468.5	11.26	15.57	11.26	2	4	9.52
10	498.5	11.98	15.57	11.98	1	4	9.88
11	508.5	12.22	15.57	12.22	7	4	10.00
12	558.5	13.42	15.57	13.42	2	4	10.60
13	558.5	13.42	15.57	13.42	1	4	10.60
14	833.5	20.03	15.57	20.03	13	4	13.91
14A	963.5	23.16	15.57	23.16	1	4	15.47

* Based on ten-year life, five-day operation, two-shifts of eight hours.

** Instructor Cost = Officer at $27K + 20% = $32K ÷ 2080 hrs/yr = $15.57/hr.

TABLE C-18 (continued)

Simulator Configuration	Cost To Acquire (in thousands)	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
15	1230.0	29.56	15.57	29.56	15	4	18.67
16	873.5	20.99	15.57	20.99	2	4	14.38
17	1410.0	33.89	15.57	33.89	3	4	20.83
18	1280.0	30.76	15.57	30.76	2	4	19.27
18A	1570.0	37.74	15.57	37.74	52	4	22.76
18B	923.5	22.19	15.57	22.19	2	4	14.99
19	2289.3	55.03	31.14	55.03	7	16	8.82
20	2017.8	48.50	31.14	48.50	8	16	8.00
21	2329.3	55.99	31.14	55.99	66	16	8.94
22	1912.8	45.98	31.14	45.98	2	16	7.69
23	2334.3	56.11	31.14	56.11	2	16	8.96
23A	1972.8	47.42	31.14	47.42	2	16	7.87
23B	2499.3	60.07	31.14	60.07			9.45
23C	2012.8	48.38	31.14	48.38	2	16	7.99
24	50.0	1.20	15.57	1.20	4	5	3.59

* Based on ten-year life, five-day operation, two-shifts of eight hours.

** Instructor Cost = Officer at $27K + 20% = $32K ÷ 2080 hrs/yr = $15.57/hr.

TABLE C-18 (continued)

Simulator Configuration	Cost To Acquire (in thousands)	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
25	142.5	3.42	15.57	3.42	6	1	22.42
26	147.5	3.54	15.57	3.54	1	1	22.66
27	157.5	3.78	15.57	3.78	1	2	11.57
28	164.5	3.95	15.57	3.95	4	2	11.73
29	174.5	4.19	15.57	4.19	2	2	11.97
30	189.5	4.55	15.57	4.55	2	2	12.34
31	209.5	5.03	15.57	5.03	17	2	12.82
31A	234.5	5.63	15.57	5.63	23	5	5.36
32	1514.5	36.40	15.57	36.40	24	6	4.72
32A	1524.5	36.64	15.57	36.64	2	9	9.87
33	1263.8	30.37	31.14	30.37	15	17	5.40
34	2523.8	60.66	31.14	60.66	15	21	7:26
35	392.3	9.43	15.57	9.43	9	4	8.60
36	799.6	19.22	15.57	19.22	13	4	13.50
37	799.6	19.22	15.57	19.22	15	4	13.50

* Based on ten-year life, five-day operation, two-shifts of eight hours.

** Instructor Cost = Officer at \$27K + 20% = \$32K $\div$ 2080 hrs/yr = \$15.57/hr.

TABLE C-18 (continued)

Simulator Configuration	Cost To Acquire (in thousands)	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
37A	1206.9	29.01	15.57	29.01	37	8	9.19
38	2195.4	52.77	31.14	52.77	14	12	11.39
38A	2400.4	57.70	31.14	57.70	3	12	12.21
38B	2496.9	60.02	31.14	60.02	2	12	12.59
39	487.3	11.71	15.57	11.71	2	4	9.74
40	1047.3	25.17	15.57	25.17	4	4	16.48
41	1057.3	25.41	15.57	25.41	11	4	16.60
41A	1067.3	25.65	15.57	25.65	2	4	16.72
41B	1077.3	25.89	15.57	25.89	4	4	16.84
42	2176.6	52.32	31.14	52.32	18	16	8.48
43	3446.6	82.85	31.14	82.85	30	20	9.84
44	3496.6	84.05	31.14	84.05	18	20	9.96
45	384.3	9.23	15.57	9.23	4	2	17.02
46	2908.1	69.90	31.14	69.90	4	19	8.99
46A	3202.6	76.98	31.14	76.98	4	21	8.81

* Based on ten-year life, five-day operation, two-shifts of eight hours.

** Instructor Cost = Officer at \$27K + 20% = \$32K ÷ 2080 hrs/yr = \$15.57/hr.

TABLE C-18 (continued)

Simulator Configuration	Cost To Acquire (in thousands)	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
47	92.3	2.21	15.57	2.21	21	2	10.00
48	2421.6	58.21	31.14	58.21	19	12	12.29
48A	2145.1	51.56	31.14	51.56	2	12	11.18
48B	2671.6	64.22	31.14	64.22	3	12	13.29
48C	2185.1	52.52	31.14	52.52	2	12	11.34
49	5809.6	139.65	77.85	139.65	47	41	8.71

* Based on ten-year life, five-day operation, two-shifts of eight hours.

** Instructor Cost = Officer at \$27K + 20% = \$32K ÷ 2080 hrs/yr = \$15.57/hr.

C3.2.1 Recommended Configuration

The final recommended 21 configurations for the 378 are summarized in Table C-19.

These twenty-one configurations actually include all the equipment and all the scenarios analyzed. As an example, simulator Configuration No. 5 includes all of the hardware and simulation inputs of Configuration Nos. 1, 2, 3 and 4.

TABLE C-19. RECOMMENDED CONFIGURATIONS SUMMARY FOR THE 378

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
CIC Surface Simulator Configuration 5	737.0	17.71	15.57	17.71	26	9	5.66
CIC Air Simulator Configuration 6	247.3	5.94	15.57	5.94	6	3	9.15
CIC Surface/Air Simulator Configuration 7 (5 & 6)	45.0	24.74	15.57	24.74	39	12	5.42
Bridge Simulator Configuration 18A	1,570.0	37.74	15.57	37.74	52	4	22.76
Bridge/CIC Simulator Configuration 23D (7 & 18A)	60.0	63.92	31.14	63.92	76	16	9.93
Communications Simulator Configuration 31A	234.5	5.63	15.57	5.63	44	5	5.36

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.

**Instructor Cost = Officer at $27K + 20% = $32K ÷ 2080 hrs/yr = $15.57/hr.

TABLE C-19 (continued)

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
Bridge/Comm Simulator Configuration 32B (18A & 31A)	25.0	43.97	15.47	43.97	12	9	11.50
CIC/Comm Simmulator Configuration 33A (7 & 31A)	25.0	30.98	31.14	30.98	15	17	5.47
Bridge/Comm/CIC Simulator Configuration 34A (23C & 32B)	25.0	68.72	31.14	68.72	29	21	8.02
Engineering Simulator Configuration 37A	1,206.9	29.01	15.57	29.01	37	8	9.19
Bridge/Engineering Simulator Configuration 38C (37A & 18A)	35.0	67.59	31.14	67.59	14	12	13.86
Navigation Simulator Configuration 47	92.3	2.21	15.57	2.21	20	2	10.00

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.
**Instructor Cost = Officer at $27K + 20% = $32K ÷ 2080 hrs/yr = $15.57/hr.

TABLE C-19 (continued)

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
CIC/Bridge/Nav Simulator Configuration 48D (7 + 18A + 47)	80.0	66.62	31.14	66.62	20	18	9.13
ASW Simulator Configuration 41B	1,077.3	25.89	15.57	25.89	4	4	16.84
CIC-ASW Simulator Configuration 42 (41B + 7)	70.0	52.32	31.14	52.32	18	16	8.48
CIC/ASW/Bridge Simulator Configuration 43A (42, 18A)	80.0	91.98	31.14	91.98	29	20	10.75
CIC-ASW-Bridge-Comm Simulator Configuration 44A (43A + 31A)	50.0	98.82	31.14	98.82	18	20	11.43
EW Simulator Configuration 45	384.3	9.23	15.57	9.23	4	2	17.02

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.

**Instructor Cost = Officer at \$27K + 20% = \$32K ÷ 2080 hrs/yr = \$15.57/hr.

TABLE C-19 (continued)

Simulator Configuration	Incremental Cost to Acquire in thousands	Hourly Cost to Acquire*	Hourly ** Cost for Instructor	Hourly Cost to Maintain*	Number of Training Scenarios	Average No. of Students Trained	Cost Hands-On Student Training Hour
CIC-EW-Bridge Simulator Configuration 46B (7, 18A, 45)	60.0	73.16	31.14	73.16	4	19	9.34
CIC-EW-ASW-Bridge-Comm Simulator Configuration 46C (7, 45, 18A, 31A 41B)	60.0	104.69	31.14	104.69	4	21	11.45
All Departments Simulator Configuration 49A	215.0	153.35	77.85	153.35	47	41	9.37
Total Cost	6,379.6						

*Based on ten-year life, five-day operation, two-shifts of eight hours, i.e., 4160 hours/year.
**Instructor Cost = Officer at $27K + 20% = $32K ÷ 2080 hrs/yr = $15.57/hr.

A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY BE EFFECTIVELY APPLIED TO THE ACCOMPLISHMENT OF COAST GUARD VESSEL OPERATIONAL TRAINING

CONTRACT DOT-CG-61814A

APPENDIX D

DATA REDUCTION AND ANALYSES OF SURVEY QUESTIONNAIRE

PREPARED FOR

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APPENDIX D

DATA REDUCTION AND ANALYSES OF SURVEY QUESTIONNAIRE

D1.0 INTRODUCTION

As part of the study conducted to "determine the applicability of simulators to Coast Guard training," a survey-questionnaire was developed entitled, "An Assessment of Current U. S. Coast Guard Operational Training Methodology." This document was forwarded to approximately 400 USCG officers who were then on, or had recently completed, PCS assignments afloat. Of these, 235 surveys were completed and returned in sufficient time to be included in the data base. The respondants included 42 Captains, 84 Commanders, 97 Lt. Commanders and 12 Chief Warrant Officers.

Exhibit D-1 provides a copy of the questionnaire. As shown, the questions fall into four categories: Section I relates to the respondant's background and experience; Section II requires subjective judgment of the relative effectiveness of various training methods for specific tasks; and Section III asks for more general assessments of the value of present training methods as well as jusgments of the potential value of certain new approaches. Section IV requests essay-type responses to inquiries into the most serious and the most frequent ship handling problems encountered.

D2.0 DATA REDUCTION

Each questionnaire, upon receipt by ADC, was reviewed and screened to assure its trouble-free entry into the data base. Then, the data from each was typed into the computer for storage until the data base was completed. In parallel with this effort, a series of diagnostic programs were developed to analyze the compiled data both individually, question by question, and in correlated combinations. In total, fifty separate programs were developed to extract these data for analysis.

D3.0 DATA ANALYSIS

D3.1 GENERAL

The data analysis produced two fundamental outputs--the first provided a broad reduction of data, question by question, and incorporated percent factors for specific elements within each question; the second output provided a finer view of the data in that the responses were assigned to specific cutters, billets and tours. These outputs are provided in the Appendix as Part 1: Detailed Analysis of Questionnaire Sections I and II, and Part 2: Data Reduction and Analysis of Questionnaire Sections I, II and III.

D3.2 FORMAL, SPECIALIZED TRAINING FOR SEAGOING ASSIGNMENTS

Two observations are apparent: (1) more XO's participated in specialized training than CO's and (2) participation for both groups increased on their respective latest tours. That is, participation in these courses appears on the increase but there is some distance yet to go. For example, only one-third of WHEC CO's had ASW training on their latest tour and only 15 percent were exposed to CIC training. Whereas these same courses were attended by 61 percent and 40 percent of WHEC XO's respectively. WMEC CO's had broader course coverage than XO's but participation of both WMEC groups was less comparable than WHEC personnel. Similarly, while a limited number of WAGB and WLB CO's participated in a small number of special courses, XO's on these class cutters were at the least level of participation.

D3.3 PARTICIPATION IN UNIT OPERATIONAL TRAINING

The survey covered 182 CO's and 140 XO's on their latest two seagoing tours aboard WHEC's, WMEC's, WAGB's and WLB's. The ratio of participation of each billet group for each operational training method were surprisingly consistent. The highest levels of participation were with Training Teams and STD's followed up by Coast Guard Multi-Unit Exercises. In third place was Refresher Training. Looking at specific cutter classes, Refresher Training is, as would be expected, above 75 percent participation for CO's and XO's on WHEC's and WMED's whereas it is less than 50 percent for WAGB and WLB types. The lowest levels of participation were assigned, in descending order, to: Training Availability, Joint Operational Exercises, Mobile Technical Units and Fleet Exercises (ASWX).

D3,4 MOST EFFECTIVE TRAINING METHODS

The survey requested that specific operational functions (CIC, SAR, etc.) be associated with the most effective method for providing the training to accomplish the operation.

The results showed that a significant number of officers/billets surveyed were unfamiliar with Mobile Technical Units, Training Availability and Fleet Operations/Exercises. Consequently these methods were not selected to each operations functions. While the respondees were familiar with Training Teams/STD's, Simulators and Multi-Unit, Joint Service Exercises, Refresher Training was selected as the overall most effective training method. It should be noted that the respondees (CO's and XO's) had an average of 5 to 7 years of seagoing experience.

D3.5 EFFECTIVENESS OF TEAM TRAINER-SIMULATORS

The 14A2 and 14A6 ASW simulators have little effective exposure with vessels and personnel other than WHEC class. Although this is to be expected, based upon assigned missions and capabilities, it is significant that one-third of the WHEC CO's and XO's are unfamiliar with the 14A2 and over half of this same group are unfamiliar with the 14A6. The STD, CIC trainers, however, have broad and generally favorable exposure across the four cutter classes (WHEC, WMEC, WAGB and WLB) evaluated here.

D3.6 UNIT MISSION PERFORMANCE READINESS

For the primary mission(s) of the cutter, their CO's and XO's generally agreed that the unit was in an above average state of readiness. However, certain mission-unique functions, such as those associated with ELT, were given a performance readiness at or below normal.

D3.7 IDENTIFICATION OF OPERATIONAL DIFFICULTIES

Damage Control was selected by all CO's and XO's, across all cutter types, as the most critical operational problem. This was followed, in severity, by Gunnery, CIC, Engineering. Among the least severe operational functions were SAR, Shiphandling, Air Helo Ops.

D3.8 OPTIMUM TOUR LENGTH

In the opinion of the responding CO's and XO's, an optimum seagoing tour length, which balances experience and career development, is 28 to 29 months.

D3.9 EFFECTS OF PERSONNEL TRANSFER/ASSIGNMENT POLICY

When asked how much the Coast Guard's transfer and assignment policies affect unit performance, greater than 90 percent of WHEC and WMEC CO's and XO's responded in the "Much" and "Very Much" categories which were the two highest categories above "Nominal," WAGB and WLB CO's and XO's responded in a similar manner but at a somewhat lesser level, 87 percent.

D3.10 CHOICE OF OPERATIONAL TRAINING FOR EXPANSION

Requested to select a single operational training technique for further expansion and application, WHEC CO's chose simulators by a slim margin over Refresher Training. WHEC XO's (50 percent) chose simulators by a wide margin over Training Teams and STD's.

WMEC CO's picked Refresher Training as a primary candidate for expansion while WMEC XO's picked simulators by a small margin over Refresher Training.

Greater than 50 percent of WAGB CO's chose Refresher Training as primary while WAGB XO's picked Training Availability. Finally both WLB CO's and XO's chose Training Teams and STD's as their primary recommendation for expansion.

D3.11 SEGMENT OF CREW IN "TRAINING"

"Training" was defined as those personnel in the learning cycle who could not yet reliably complete all functions within their assignment.

All CO's across the four vessels (WHEC, WMEC, WAGB, WLB) concurred in the basic order of departmental trainee content. Thus:

Operations 27 % - 40% in training

Engineering 33% - 40% in training

Deck/Weapons 45% - 54% in training

Similarly, all XO's were in basic agreement on the order of department trainee content:

Operations 31% - 37% in training

Engineering 32% - 40% in training

Deck/Weapons 43% - 50% in training

Based on these data, it may be generally stated that one-third of Operations, forty percent of Engineering and half of Deck/Weapons personnel are trainees.

D3.12 TRAINEES WITHIN OPERATIONS DEPARTMENT

Within the Operations Department, officer and enlisted personnel in the training cycle were identified to Navigation, CIC/ASW and/or Communications Divisions. CO's across all four cutter classes (WHEC, WMEC, WAGB and WLB) responded that from one-third to over one-half of the officers in all these divisions were in the learning cycle. These same CO's placed the enlisted trainee content in all three divisions between one-third and one-half. Thus, CO's across the four cutter classes evaluated established that there was a larger proportion of officers in the training cycle than enlisted personnel within all three divisions. XO's for these same vessels were in agreement except that the ratio of personnel in training was indicated to be higher, e.g., 40 percent to 60 percent of officers and 30 percent to 50 percent of enlisted across all three Divisions.

D3.13 UNIT READINESS TO PERFORM PRIMARY MISSION

Across the four cutter classes (WHEC, WMEC, WAGB and WLB), the primary mission(s) responsibility was indicated to be ELT, Military Preparedness, Polar Operations, SAR and Aids to Navigation. The results of the readiness analysis, to perform such missions, is as follows: All CO's and XO's rated their readiness to perform their primary mission(s) at above average. WAGB CO's and XO's, indicating

a single primary mission of Polar Operations, indicated an above-nominal readiness, and 93 percent of the WLB CO's rated their Aids to Navigation readiness at above average.

EXHIBIT D-1

SURVEY QUESTIONNAIRE

AN ASSESSMENT OF CURRENT U. S. COAST GUARD OPERATIONAL TRAINING METHODOLOGY

PREPARED FOR:

U. S. Coast Guard Headquarters
Washington, D.C. 20590

PREPARED BY:

Applied Digital Communications
214 West Main Street
Moorestown, New Jersey 08057

November 1976

INTRODUCTION

This survey questionnaire is divided into four sections as follows:

Section	Title
I	Background Information
II	Operational Performance and Training Assessment
III	Mission/Systems/Training Inquiry
IV	Essay Questions

Each Section is structured to provide different types of information although all questions relate to operational performance and its supportive training system.

In order to facilitate subsequent statistical processing, you are requested to fully complete all four sections. This is not a test; there are no "right" or "wrong" answers. Your proper response is simply the most accurate, factual and/or objective answer based on your experience.

DEFINITION

As used herein, "Operational Training refers to team training which the service member receives at his duty station or other approved locations. The training is the responsibility of the unit, group, district and area commanders and includes underway refresher training, STD training, and so forth." (USCG SHORE FACILITIES PLAN, 3-GAP-5)

INSTRUCTION

To assure timely and uniform processing of all questionnaires, it is requested that you complete and return the document, using the stamped envelope provided, as soon as possible.

SECTION 1

BACKGROUND INFORMATION

Do Not Fill In This Item -- For Internal Use Only	
1. Survey Control Number	1 2 3 4 5 6 7 8 9

2. Rank: 10 11 12 13

3. Status Indicator: 14 15 16 17 18 19

4. Experience Indicator: 20 21 22 23 24 25 26 27

5. Year Commissioned: 19 28 29 Group: 19 30 31

6. Have you completed a post graduate program as a Coast Guard Officer?

32 Yes — Special Training Code (Ref. Page XI of CG-111) 33 34

35 No

7. List your four most recent PCS assignments afloat beginning with your latest (Tour #1).

Tour Number	Year Completed	Total Tour Duration (Mo.)	Cutter Designation (i.e., WHEC)	Most Senior Billet (i.e., CO, XO, OPS)	
36 1	19 37 38	39 40	41 42 43 44	45 46 47	
48 2	19 49 50	51 52	53 54 55 56	57 58 59	
60 3	19 61 62	63 64	65 66 67 68	69 70 71	79 80
10 4	19 11 12	13 14	15 16 17 18	19 20 21	

8. Special/Advanced Training - Please indicate in the appropriate blocks the number of weeks of formal training received in conjunction with the tours listed above.

Tour Number	Training Course						
22 1	23 __ Wks ASW	24 __ Wks CIC	25 __ Wks NAV	26 __ Wks SAR	27 __ Wks WEAPONS	28 __ Wks HELO OPS	29 __ Wks SHIP HANDLING
	30 __ Wks COMM	31 __ Wks ENG		32 __ Wks RULES OF ROAD		33 __ Wks DAMAGE CONTROL	34 __ Wks OTHER ______

(continued on next page)

8. (continued from previous Page)

Tour No. **Training Course**

Tour No.							
35 [2]	36 [ ] Wks ASW	37 [ ] Wks CIC	38 [ ] Wks NAV	39 [ ] Wks SAR	40 [ ] Wks WEAPONS	41 [ ] Wks HELO OPS	42 [ ] SHIP HANDLING
	43 [ ] Wks COMM	44 [ ] Wks ENG	45 [ ] Wks RULES OF ROAD	46 [ ] Wks DAMAGE CONTROL	47 [ ] Wks OTHER ________		
48 [3]	49 [ ] Wks ASW	50 [ ] Wks CIC	51 [ ] Wks NAV	52 [ ] Wks SAR	53 [ ] Wks WEAPONS	54 [ ] Wks HELO OPS	55 [ ] SHIP HANDLING
	56 [ ] Wks COMM	57 [ ] Wks ENG	58 [ ] Wks RULES OF ROAD	59 [ ] Wks DAMAGE CONTROL	60 [ ] Wks OTHER ________		
61 [4]	62 [ ] Wks ASW	63 [ ] Wks CIC	64 [ ] Wks NAV	65 [ ] Wks SAR	66 [ ] Wks WEAPONS	67 [ ] Wks HELO OPS	68 [ ] SHIP HANDLING
	69 [ ] Wks COMM	70 [ ] Wks ENG	71 [ ] Wks RULES OF ROAD	72 [ ] Wks DAMAGE CONTROL	73 [ ] Wks OTHER ________		

79 80 [0|2]

9. While on seagoing assignment, which of the following types of operational training did you (or your crew members) participate? (i.e., training conducted during one or more of the seagoing tours listed in Item 7 of this section)

Operational Training	Participate? Yes	Participate? No	Tour Number (check) 1	2	3	4
a. Training Teams and Std's	10	11	12	13	14	15
b. Mobile Technical Units (MOTU)	16	17	18	19	20	21
c. Training Availability	22	23	24	25	26	27
d. Refresher Training	28	29	30	31	32	33
e. Shakedown Training	34	35	36	37	38	39
f. C.G. Multi-Unit Exercises	40	41	42	43	44	45
g. Joint Operational Exercises	46	47	48	49	50	51
h. Fleet Exercises (ASWEX)	52	53	54	55	56	57

79 80 [0|3]

10. Please indicate, by placing a P or S in the appropriate Tour Number Block, the primary and secondary mission assignments for each of the tours listed in Item 7 of this Section.

Mission	Tour Numbers 1	2	3	4
a. Enforcement of Laws and Treaties	10	11	12	13
b. Domestic Icebreaking	14	15	16	17
c. Marine Environmental Protection	18	19	20	21
d. Military Preparedness	22	23	24	25
e. Military Operations (combat)	26	27	28	29
f. Polar Operations	30	31	32	33
g. Search and Rescue	34	35	36	37
h. Aids to Navigation	38	39	40	41
i. Marine Science Activities	42	43	44	45
j. Ocean Station	46	47	48	49
h. Training	50	51	52	53
l. Other ______________________	54	55	56	57

79	80
0	4

SECTION II

OPERATIONAL PERFORMANCE AND TRAINING ASSESSMENT

1. Based on your experience* with the Training Methods listed, and assuming that they represent the total inventory of training resources available, please check the most effective, or potentially effective, method for the indicated operational functions. NOTE: Properly completed, each operational function column should have no more than one box checked.

* If you have no direct experience with a particular training method, check the first block in the appropriate row.

TRAINING METHOD	No Experience	ASW Ops	CIC Ops	SAR Ops	Air/ Helo Flight Deck	Comm	Brdg/ Nav Ops	Ship-hndl-ing	Gun-nery	Deck Sea-man-ship	Damage Contrl	En-gin-eer-ing
1. Training Teams and STD's	10	11	12	13	14	15	16	17	18	19	20	21
2. Mobile Technical Units (MOTU)	22	23	24	25	26	27	28	29	30	31	32	33
3. Training Avail-ability	34	35	36	37	38	39	40	41	42	43	44	45
4. Simulators	46	47	48	49	50	51	52	53	54	55	56	57
5. Refresher Training	58	59	60	61	62	63	64	65	66	67	68	69
6. Multi-Unit/ Joint Service Exercises	10	11	12	13	14	15	16	17	18	19	20	21
7. Fleet (other than exercises) *	22	23	24	25	26	27	28	29	30	31	32	33
8. Fleet Exercises (ASWX)	34	35	36	37	38	39	40	41	42	43	44	45

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0 5

2. Similarly, please indicate your estimate of the operational effectiveness achieved through specific team training provided by the following simulators:

	ASW		CIC	
	14A2	14A6	STD (Mobile Unit)	Multi-Unit, Triple Threat Systems
1. Low	46	47	48	49
2. Below Normal	50	51	52	53
3. Normal	54	55	56	57
4. Above Normal	58	59	60	61
5. High	62	63	64	65
6. Unknown - No Opinion	66	67	68	69

79 80

0 6

3. On a scale of 1 to 5 (3 being minimally acceptable) rate the present operational training program on its ability to prepare vessels to perform: (a) all aspects of each mission (i.e., navigation, deck seamanship, damage control, etc.) and (b) the specific mission-unique aspects of each of the following:

Mission	Compatibility Scale Factor	
	All Aspects	Mission - Unique Aspects
a. Enforcement of Laws and Treaties	10	11
b. Domestic Icebreaking	12	13
c. Marine Environmental Protection	14	15
d. Military Preparedness	16	17
e. Military Operations (combat)	18	19
f. Polar Operations	20	21
g. Search and Rescue	22	23
h. Aids to Navigation	24	25
i. Marine Science Activities	26	27
j. Ocean Station	28	29

4. In general, how effective is CG-415 Unit Training (Afloat) in maintaining the operational proficiency achieved by the various departments through the operational training methods listed in Question 1 above:

% Effective 30 31

5. Can proficiency developed at Refresher Training be maintained by Unit OJT training?

32 Yes — How Long: 3 Mos. 33 6 Mos. 34 12 Mos. 35 18 Mos. 36

24 Mos. 37 36 Mos. 38

Why not longer than you indicated? ____________________

39 No Why? ____________________

6. Does effectiveness of Unit OJT vary with Department?

Yes 40 No 41 Within Departments? Yes 42 No 43

(continued on next page)

6. (continued from previous page)

If yes, which one of the following operational areas is most affected by variations in Unit OJT effectiveness?

- ASW Ops [44] ☐
- CIC Ops [45] ☐
- SAR Ops [46] ☐
- Air/Helo Flight Deck [47] ☐
- Communications [48] ☐
- Bridge/Nav Ops [49] ☐
- Shiphandling [50] ☐
- Gunnery [51] ☐
- Deck Seamanship [52] ☐
- Damage Control [53] ☐
- Engineering [54] ☐
- All Equally Affected [55] ☐

7. What is your estimate of the average grade (in %) achieved at Refresher Training by USCG units?

[56] [57] ☐☐

8. Is this an optimal grade for USCG operations; i.e., assuring proficiency while minimizing non-operational training time?

Yes [58] ☐

If not, what is? [59] [60] ☐☐ %

9. If any of the training methods listed in Question 1 of this section could be expanded, in terms of time and resource allocation, which of the eight would be your primary choice:

[61] ☐ Enter number choice (1 thru 8) from Question 1, Section II

[62] ☐ Your second choice

10. Select and rank (1,2,3,4,5) five of the operational functions that continually cause difficulty in evaluation exercises, in their order of severity (#1 is most severe).

Operational Functions	Rank Order
1. ASW Ops	[63] ☐
2. CIC Ops	[64] ☐
3. SAR Ops	[65] ☐
4. Air/Helo Flight Deck	[66] ☐
5. Communications	[67] ☐
6. Bridge/Nav Ops	[68] ☐
7. Shiphandling	[69] ☐

(continued on next page)

10. (continued from previous page)

Operational Functions	Rank Order
8. Gunnery	70 [ ]
9. Deck Seamanship	71 [ ]
10. Damage Control	72 [ ]
11. Engineering	73 [ ]

79 80 [0 | 7]

11. Do training time or training assignment limitations adversely affect proficiency?

Yes 10 [ ] No 11 [ ]

How Much? Very Little 12 [ ] Little 13 [ ] Nominal 14 [ ] Much 15 [ ] Very Much 16 [ ]

12. What is an optimum seagoing tour length to balance on-board experience and career development?

17 18 [|] Months

13. How much do personnel transfer and assignment policies affect team performance and skill development?

Very Little 19 [ ] Little 20 [ ] Nominal 21 [ ] Much 22 [ ] Very Much 23 [ ]

14. Please estimate the segment of your crew complement within the following departments that has typically been in the learning cycle: (i.e., could not be expected to reliably complete all functions within duty assignment).

% of Assigned Personnel in Learning Cycle	Department
24 25 [|]	Operations
26 27 [|]	Engineering
28 29 [|]	Deck/Weapons

15. Within the Operations Department what portion of the officers and men (of your present or latest ship) are typically in the learning cycle as defined in 13 above?

% of Assigned Officers in Learning Cycle	% of Assigned Crewmen in Learning Cycle	Division
30 31 [|]	32 33 [|]	Navigation
34 35 [|]	36 37 [|]	CIC/ASW
38 39 [|]	40 41 [|]	Communications

16. Please check the mission(s) for which your current or latest ship had direct responsibility and estimate, on a scale of 1 to 5 (3 being minimally acceptable) its readiness to perform the mission(s).

	Mission Responsibilities	Estimated Actual Readiness
42 [ ]	a. Enforcement of Laws and Treaties	43 [ ]
44 [ ]	b. Domestic Icebreaking	45 [ ]
46 [ ]	c. Marine Environmental Protection	47 [ ]
48 [ ]	d. Military Preparedness	49 [ ]
50 [ ]	e. Military Operations (combat)	51 [ ]
52 [ ]	f. Polar Operations	53 [ ]
54 [ ]	g. Search and Rescue	55 [ ]
56 [ ]	h. Aids to Navigation	57 [ ]
58 [ ]	i. Marine Science Activities	59 [ ]
60 [ ]	j. Ocean Station	61 [ ]

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17. Use the following rating scale to associate the significance of the operational functions with the indicated USCG missions:

Rating Scale:
- 0 - Not Significant
- 1 - Low Significance
- 2 - Below Normal Significance
- 3 - Normal Significance
- 4 - Above Normal Significance
- 5 - High Significance
- 6 - Not Relevant

MISSIONS	OPERATIONAL FUNCTION										
	ASW Ops	CIC Ops	SAR Ops	Air/ Helo Flght Deck	Comm	Brdg/ Nav Ops	Ship-hand-ling	Gun-nery	Deck Sea-man-ship	Dam-age Cntrl	En-gin-eering
a. Enforcement of Laws and Treaties	10	11	12	13	14	15	16	17	18	19	20
b. Domestic Ice-breaking	21	22	23	24	25	26	27	28	29	30	31
c. Marine Environ-mental Protection	32	33	34	35	36	37	38	39	40	41	42
d. Military Preparedness	43	44	45	46	47	48	49	50	51	52	53
e. Military Opera-tions (Combat)	54	55	56	57	58	59	60	61	62	63	64
f. Polar Operations	65	66	67	68	69	70	71	72	73	74	75
g. Search and Rescue	10	11	12	13	14	15	16	17	18	19	20
h. Aids to Navigation	21	22	23	24	25	26	27	28	29	30	31

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17. (continued from previous page)

MISSIONS	ASW Ops	CIC Ops	SAR Ops	Air/ Helo Flght Deck	Comm	Brdg/ Nav Ops	Ship-hand-ling	Gun-nery	Deck Sea-man-ship	Dam-age Cntrl	En-gin-eer-ing
	OPERATIONAL FUNCTION										
i. Marine Science Activities	32	33	34	35	36	37	38	39	40	41	42
j. Ocean Station	43	44	45	46	47	48	49	50	51	52	53

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1 0

18. This is a multiple element question which associates, in an ordered way, specific training methodologies with operational tasks within major categories. Please use the rating scale to associate the significance of the indicated training methods with the operational tasks listed for each category.

Rating Scale:
- 0 - Not Significant
- 1 - Low Significance
- 2 - Below Normal Significance
- 3 - Normal Significance
- 4 - Above Normal Significance
- 5 - High Significance
- 9 - Not Relevant

OPERATIONAL CATEGORY/ TASKS	Classroom (Formal, Individual)	On-The-Job Training	Simulators	Texts/Manuals/ Audio-Visual	Training Teams/ STD's	Training Availability	Refresher Training	Fleet Exercises
	TRAINING METHODS							
NAVIGATION								
Celestial	10	11	12	13	14	15	16	17
Piloting	18	19	20	21	22	23	24	25
Electronic	26	27	28	29	30	31	32	33
Fog	34	35	36	37	38	39	40	41
DECK								
Anchoring	42	43	44	45	46	47	48	49
Docking	50	51	52	53	54	55	56	57
Boat Lowering	58	59	60	61	62	63	64	65
Boat Handling	66	67	68	69	70	71	72	73
Towing	10	11	12	13	14	15	16	17
Helo Deck Ops	18	19	20	21	22	23	24	25
GUNNERY								
Spotting	26	27	28	29	30	31	32	33
Gun Mount Procedures	34	35	36	37	38	39	40	41
Fire Control	42	43	44	45	46	47	48	49
Liaison	50	51	52	53	54	55	56	57

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1 1

(continued on next page)

18. (continued from previous page)

Rating Scale:

0 - Not Significant
1 - Low Significance
2 - Below Normal Significance
3 - Normal Significance
4 - Above Normal Significance
5 - High Significance
9 - Not Relevant

OPERATIONAL CATEGORY/ TASKS	TRAINING METHODS									
	Classroom (Formal, Individual)	On-The-Job Training	Simulators	Texts/Manuals/ Audio-Visual	Training Teams/ STD's	Training Availability	Refresher Training	Fleet Exercises		
SHIP HANDLING										
Anchoring	58	59	60	61	62	63	64	65		
Docking	66	67	68	69	70	71	72	73	79: 1	80: 2
Collision Avoidance	10	11	12	13	14	15	16	17		
Rules of the Road	18	19	20	21	22	23	24	25		
Ice Breaking	26	27	28	29	30	31	32	33		
Heavy Weather	34	35	36	37	38	39	40	41		
CIC										
Anti-Air (AAW)	42	43	44	45	46	47	48	49		
Anti-Surface	50	51	52	53	54	55	56	57		
Anti-Submarine (ASW)	58	59	60	61	62	63	64	65		
Fog Navigation	66	67	68	69	70	71	72	73	79: 1	80: 3
Collision Avoidance	10	11	12	13	14	15	16	17		
Stationing	18	19	20	21	22	23	24	25		
SAR Air Control	26	27	28	29	30	31	32	33		
COMMUNICATIONS										
Visual	34	35	36	37	38	39	40	41		
Voice	42	43	44	45	46	47	48	49		
On-Line Crypto	50	51	52	53	54	55	56	57		
Off-Line Crypto	58	59	60	61	62	63	64	65		
DAMAGE CONTROL	66	67	68	69	70	71	72	73	79: 1	80: 4

SECTION III

MISSION/SYSTEMS/TRAINING ASSESSMENT

Read each of the following statements carefully and indicate in the blank space to the left of each how much you agree or disagree with it. Use one of the following numbers to indicate your choice:

1 - Strongly Disagree	4 - Slightly Agree
2 - Moderately Disagree	5 - Moderately Agree
3 - Slightly Disagree	6 - Strongly Agree

1. 10 [ ] In general, U. S. Coast Guard units maintain a high level of operational readiness.

2. 11 [ ] WHEC crewmen are generally better qualified than their WMEC counterparts because of their more frequent and intense training.

3. 12 [ ] The current scope of U. S. Coast Guard operational training is adequate to maintain an acceptable level of fleet readiness.

4. 13 [ ] OJT is fundamental to retention of skills between scheduled training exercises.

5. 14 [ ] In order to be totally effective, the Bridge/CIC-ASW/Communications/Engineering team should be together for at least one year.

6. 15 [ ] Due to the multi-mission assignment of most floating units, optimum proficiency in each mission at all times is not possible.

7. 16 [ ] Refresher training assures the optimum level of readiness for each department.

8. 17 [ ] In terms of mission complexity and training demand, Navigation and CIC/ASW operations are the most significant.

9. 18 [ ] Operation Department team effectivity is difficult to maintain with the current mix of training opportunities and allocation.

10. 19 [ ] Any increase in the frequency and/or intensity of current navigation and CIC training would significantly increase unit performance.

11. 20 [ ] Many of the problems associated with maintaining team proficiency are due to personnel transfers and/or reassignment of responsibility.

12. 21 [ ] Upon assignment to a seagoing billet, many enlisted personnel require specialized or refresher training ashore.

13. 22 [ ] Properly implemented and applied, Unit Training Manual Afloat exercises consume at least 50% of an average day's activities.

14. 23 [ ] Introduction of new missions and/or systems-equipments requires a broad-based training effort both at shore-based schools and aboard the operating unit.

15. 24 [ ] Introduction of advanced systems such as COMDAC will require significant changes in the current methods used to train operations personnel.

16. 25 [ ] Specific function simulators such as radar navigation, and ASW, with high training transfer ratios, can effectively duplicate seagoing experience.

17. 26 [ ] Simulators, properly employed, can provide fundamental (entry-level), refresher and advanced ship handling training, thus substantially shortening the "learning curve" in specific areas.

79 80
[1][5]

SECTION IV

ESSAY QUESTIONS

1. Describe the most serious operational problem relative to ship handling/navigation/ maneuvering that you have encountered and the technique used to resolve the problem. Please suggest how to best simulate the problem for an effective training exercise.

2. Describe the most frequent, troublesome ship handling/navigation/maneuvering problems that you have encountered (ship type, operation/exercise) and how to best simulate the problem for an effective training exercise.

APPENDIX D

PART 1: DETAILED ANALYSIS OF QUESTIONNAIRE SECTIONS I AND II

APPENDIX D - PART 1

QUESTIONNAIRE SECTION I - BACKGROUND INFORMATION

SECTION I, Question #6

This inquiry identifies any formal post graduate program that the officer has completed and identifies him relative to the billet and vessel assignment of his latest tour afloat.

These data are summarized in the following table wherein the ratio of the officers surveyed who completed a specific graduate program are presented.

TABLE D1-1

Training Code	PERCENT * OF SURVEYED OFFICERS WITH ADVANCED TRAINING							Course Title
	WHEC		WMEC		WAGB		WLB	
	CO 65%	XO 52%	CO 67%	XO 61%	CO 50%	XO 44%	CO 41%	
01	14		29		25	25	13	Armed Forces Staff College
06		8	7	12		25		Electronics Engineering
11							13	Engineering Physics
14							13	Business Administration
16	14							Communications
17			7					Law
19				35	25			Oceanography
21	9	8						Nuclear Engineering (Effects)
22			7					Personnel Administration
23		8						Merchant Marine Industry
29	9			18		25		Communications Engineering
34	18	25	21	12			31	Management
39	9					25	13	Public Administration
52		8						Operations Research
55		8						Humanities
57				12				Communications Management
60		8						Financial Management
62		8						Computer Systems Management

* Blanks indicate "0" or insignificant participation, therefore, columns may not add to 100%. Percents shown are of those who had advanced training, not of entire group. Percentages shown beside billets (CO, XO) indicate the level of advanced training participation for that group.

SECTION I, Question #8

This question requested that the officer indicate the number of weeks of formal training received in conjunction with the PCS tours afloat.

This analysis does not address the quantity (weeks) of training but rather, fundamentally, the number of officers, by tour number, vessel type and billet, that participated in such training. Therefore, numbers quoted in succeeding paragraphs indicate the percent of participation of the group surveyed.

WHEC

CO's - For the latest tour (#1) there is a broad distribution across all special training titles. ASW had the single highest participation with 35% and Rules of Road at 21%. The prior tour, however, (#2) had limited participation and training for the officers surveyed and was limited to ASW and Rules of Road.

XO's - For both the latest tour (#1) and the prior tour (#2), distribution of courses taken is fairly board. With the exception of Engineering, all special training courses were participated in. For both tours, ASW and CIC have the highest participation in that order.

WMEC

CO's - Here, both tour groups (#1 & #2) have broad representative coverage of the course titles listed with the greatest participation in Helo Operations for both groups. SAR, Rule of Road, Damage Control and CIC were also high participants.

XO's - Both tour groups #1 and #2 show no participation in ASW, Engineering or Communications, however, CIC, SAR, Helo Operations, Ship Handling and Rules of Road are highly utilized.

WAGB

CO's - Highest participation for both tours was in Helo Operations. However, this is the singular utilization for training on the second tour whereas first tour personnel participated in CIC, SAR, Rules of Road and Damage Control in addition to Helo Operations.

XO's - The distribution for this group was different in that Helo Operations was not heavily utilized. Emphasis in this group sample across both tours was in SAR, CIC, Ship Handling, Damage Control and Rules of Road.

WLB

CO's &
XO's - Tour #1 CO's had broad coverage of subjects although only half participated in the courses listed. Represention of CO's from Tour #2 and XO's from both tours was minimal primarily in Damage Control and Rules of Road.

Summary

A good overview of the participation in the various special training courses is provided by listing the overall present participation across all vessels and both tours for each billet. This is provided in the following table.

TABLE D1-2. OVERALL PARTICIPATION (%) IN SPECIAL TRAINING*

FORMAL TRAINING COURSE TITLE	CO's	XO's
ASW	9	20
CIC	8	19
NAV	2	4
SAR	9	7
WEAPONS	2	4
HELO OPS	14	6
SHIP HANDLING	7	10
COMM	2	1
ENGINEERING	2	0
RULES OF ROAD	15	12
DAMAGE CONTROL	10	11

*For the two most recent tours (#1 & #2) and all vessels surveyed; WHEC, WMEC, WAGB, WLB.

Columns do not add to 100% due to checks in OTHER category and blank answers.

TABLE D1-3. PERCENT PARTICIPATION IN FORMAL TRAINING COURSES

TRAINING	PERCENT PARTICIPATION[1]									PERCENT PARTICIPATION BOTH TOURS					Overall
	LATEST TOUR (#1)				SECOND LATEST TOUR (#2)										
	WHEC	WMEC	WAGB	WLB	WHEC	WMEC	WAGB	WLB	WAGO						
	CO's (34)	CO's (42)	CO's (8)	CO's (39)	CO's (9)	CO's (18)	CO's (3)	CO's (29)	CO's (0)	WHEC	WMEC	WAGB	WLB	WAGO	
ASW	35	2	0	0	33	6	0	0	0	35	3	0	0	0	9
CIC	15	7	13	5	0	11	0	3	0	12	8	9	4	0	8
NAV	0	2	0	8	0	0	0	0	0	0	2	0	4	0	2
SAR	8	17	13	5	0	6	0	7	0	7	13	9	6	0	9
Weapons	3	2	0	3	0	6	0	0	0	2	3	0	1	0	2
Helo Ops	18	24	50	0	0	17	67	0	0	14	22	55	0	0	14
Ship Handling	15	10	0	0	0	6	0	7	0	12	8	0	3	33	7
Comm	0	2	0	5	0	6	0	0	0	0	3	0	3	0	2
Eng	3	5	0	0	0	6	0	0	0	7	5	0	0	0	2
Rules of Road	21	19	13	18	11	6	0	7	0	19	15	9	13	33	15
Damage Control	8	12	13	10	0	11	0	7	0	7	12	9	9	33	10
Other	24	26	25	54	0	11	33	41	0	19	22	27	49	0	31
	WHEC XO (23)	WMEC XO (28	WAGB XO (9)	WLB XO (11)	WHEC XO (27)	WMEC XO (13)	WAGB XO (6)	WLB XO (23)	WAGO XO (0)	WHEC	WMEC	WAGB	WLB	WAGO	
ASW	61	0	0	0	52	0	0	0	0	56	0	0	0	0	20
CIC	48	18	11	0	26	23	0	0	0	36	20	7	0	0	19
NAV	13	0	0	0	4	15	0	0	0	8	5	0	0	0	4
SAR	9	4	0	9	4	23	17	4	0	6	10	7	6	0	7
Weapons	17	4	0	0	4	0	0	0	0	10	2	0	0	0	4
Helo Ops	13	7	11	0	4	15	0	0	0	8	10	7	0	0	6
Ship Handling	17	21	11	0	7	0	17	0	0	12	15	13	0	0	10
Comm	4	0	0	0	4	0	0	0	0	4	0	0	0	0	1
Eng	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rules of Road	17	29	0	9	4	0	33	4	0	10	20	13	6	100	12
Damage Control	22	7	11	9	0	0	17	22	0	10	5	13	18	0	11
Other	26	21	11	55	11	15	17	17	0	18	20	13	29	0	21

1. Column totals may exceed 100% since a single tour could encompass more than one type of Operational Training.

SECTION I, Question #9

This question asks the officers to identify the types of operational training in which they participated while on seagoing assignment (tours). The survey covered 182 CO's across their latest two seagoing tours involving four cutter classes: WHEC, WMEC, WAGB, WLB. Similarly, 140 XO's were surveyed across their latest two tours on the same cutter classes. Their involvement and participation in the various operational training methods available has been determined and is expressed in percent of total officers within a billet within a cutter class for each tour. For example, 85% of the WHEC CO's surveyed were involved with Training Teams & STD's during their latest tour (#1).

WHEC

CO's - This group indicated a broader scope of participation across all training methods although participation in a particular method may have been less than with WMEC class cutters. Half (50%) or more of the WHEC CO's surveyed experienced all of the operational training methods listed during their latest tour (#1). WHEC CO's on second latest tour (#2) had over 50% participation in all but three training methods: Mobile Technical Units, Joint Operational Exercises, Fleet Exercises (ASWX). This increase in exposure to operational training on Tour #1 over Tour #2 is generally true for all billet/cutter combinations.

XO's - These personnel also had over 50% representation at all but three training methods: Mobile Technical Units, C. G. Joint Operational Exercises, and Fleet Exercises (ASWX), during their latest tour (#1).

WHEC XO's on their second latest tour only exceeded 50% participation in three categories: Training Teams & STD's, Refresher Training, and C.G. Multi-Unit Exercises. Thus, the training categories to which less than half of the WHEC XO's were not exposed on their second latest tour were: Mobile Technical Units, Training Availability, C.G. Joint Operational Exercises and Fleet Exercises (ASWX).

WMEC

CO's - This group indicated zero participation with Mobile Technical Units and Fleet Exercises (ASWX) during their latest tour (#1). This is also true of WHEC CO's on the second latest tour (#2). The highest level of participation (77% across both groups (Tour #1, #2) is with Training Teams & STD's and C.G. Multi-Unit Exercises.

XO's - This group also indicated zero participation with Mobile Technical Units and Fleet Exercises (ASWX) during both Tour #1 and #2. While approximately 90% of the WMEC XO's on the latest tour (#1) participated in Refresher Training, only 46% of the CO's on the previous tour (#2) participated in Refresher Training. A similar substantial difference is true with Training Availability; Tour #1 personnel participated at a level of 57%, or slightly better than half the XO's surveyed for that tour whereas only 15% of the Tour #2 personnel were involved with this type training.

WAGB

CO's &
XO's - It may be generally stated that Tour #1 (latest) WAGB CO's and XO's participated in more types of operational training than personnel on prior tours. For example, CO's on prior Tour #2 show 0% participation with Mobile Technical Units, Training Availability and Refresher Training whereas Tour #1 CO's participation was 13%, 30% and 38%, respectively. On the other hand, participation in C.G. Multi-Unit Exercises dropped from 67% during Tour #2 to 25% on Tour #1. This was also true for XO's participating in C.G. Multi-Unit Exercises which went from 67% on Tour #2 to 22% on Tour #1.

WLB

CO's &
XO's - WLB CO's on both tours participated in the same number and type of training methods and conversely did not participate in the same methods. That is, both tour groups indicated significant levels of participation in: Training Teams & STD's, Training Availability, Refresher Training and C.G. Multi-Unit Exercises. Both groups were mutually absent from participation in Mobile Technical Units, Joint Operational Exercises and Fleet Exercises (ASWX).

Summary

A good overview of the participation in various training methods is provided by listing the overall present participation across all vessels and both tours for each billet. This is given in the following table.

TABLE D1-4. OVERALL PARTICIPATION (%) IN OPERATIONAL TRAINING*

OPERATIONAL TRAINING METHOD	CO's	XO's
Training Teams & STD's	78%	76%
Mobile Technical Units	14%	16%
Training Availability	37%	32%
Refresher Training	59%	63%
C.G. Multi-Unit Exercises	70%	72%
Joint Operational Exercises	16%	17%
Fleet Exercises (ASWX)	11%	9%

*For the two most recent tours (#1, #2) and all vessels surveyed: WHEC, WMEC, WAGB, WLB.

Column totals exceed 100% since more than one training exercise is taken during a given tour.

TABLE D1-5

OPERATIONAL TRAINING	PERCENT PARTICIPATION [1,2]												
	LATEST TOUR (#1)				SECOND LATEST TOUR (#2)				PERCENT PARTICIPATION--BOTH TOURS				
	WHEC CO (34)	WMEC CO (42)	WAGB CO (8)	WLB CO (34)	WHEC CO (9)	WMEC CO (18)	WAGB CO (3)	WLB CO (24)	WHEC	WMEC	WAGB	WLB	OVERALL
Training Teams & STDs	85	88	63	72	89	72	67	76	86	83	64	74	78
Mobile Technical Units	53	0	13	0	44	0	0	0	51	-	9	-	14
Training Availability	62	43	38	26	78	17	0	21	65	35	27	24	37
Refresher Training	82	76	38	56	78	39	0	38	81	65	27	49	59
C.G. Multi-Unit Exer.	85	88	25	69	89	72	67	41	86	83	36	19	70
Joint Ops Exer.	50	12	0	0	22	11	0	0	44	12	0	-	16
Fleet Exercises	59	0	0	0	11	0	0	0	26	0	0	0	11
	WHEC XO (23)	WMEC XO (28)	WAGB XO (9)	WLB XO (11)	WHEC XO (27)	WMEC XO (13)	WAGB XO (6)	WLB XO (23)	WHEC	WMEC	WAGB	WLB	OVERALL
Training Teams & STDs	78	89	56	73	74	77	83	70	76	85	67	71	76
Mobile Technical Units	43	0	11	0	19	0	0	0	30	12	7	-	16
Training Availability	52	57	0	0	41	15	33	0	46	44	13	6	32
Refresher Training	78	89	11	55	85	46	17	39	82	76	13	44	63
C.G. Multi-Unit Exer.	65	75	22	64	81	77	67	87	74	76	40	79	72
Joint Ops Exer	39	11	11	0	37	0	0	0	38	11	7	0	17
Fleet Exer (ASWX)	43	0	0	0	11	0	0	0	26	0	0	0	9

1. Column totals may exceed 100% since a single tour could encompass more than one type of Operational Training.
2. Quantities in parentheses beside each billet identifier (i.e., CO, XO) indicate the number in the survey sample.

SECTION I, Question #10

This question requested the officer to indicate those missions that he considered primary and those that were secondary on each of his four latest tours afloat. The analysis presented here considers only his latest tour (#1).

Both CO's and XO's aboard WHEC's and WMEC's agreed, in the majority, that their primary mission was ELT. Other missions indicated as primary, but with lesser majorities, were: Military Preparedness, SAR and Ocean Station. WAGB CO's and XO's selected Polar Operations as primary with lower percentage selections given to Domestic Ice-breaking, and Marine Science. Similarly, WLB CO's and XO's in significant majorities, indicated their primary mission as Aids to Navigation with a second choice of SAR.

Secondary mission selections were less definitive in that many were chosen with almost equal preference. Substantially the same percentage of WHEC CO's and XO's felt that their secondary mission was: Military Preparedness, SAR and Marine Science Activities. This was also true with WMEC CO's and XO's which were compatible in selecting: Military Preparedness, SAR, and ELT as their secondary mission.

WAGB CO's and XO's were only in substantial agreement on one secondary mission; Marine Science Activities. Fifty percent (50%) of the WAGB CO's surveyed indicated that SAR was a secondary mission, however, only 33% of the XO's made a similar selection. WLB personnel chose ELT, Military Preparedness and SAR.

TABLE D1-6. PRIMARY MISSION ALLOCATION - TOUR #1 - PERCENT PARTICIPATION

MISSION	ASSIGNMENT	WHEC		WMEC		WAGB		WLB	
		CO	XO	CO	XO	CO	XO	CO	XO
ELT	Primary	62	65	71	68	0	0	0	9
	Secondary	21	13	29	25	25	22	69	78
	None	17	22	0	7	75	78	31	13
Domestic Icebreaking	Primary	0	0	0	0	25	33	10	9
	Secondary	0	0	0	0	13	0	36	55
	None	100	100	100	100	62	67	54	36
Marine Environmental Protection	Primary	0	0	0	0	0	0	0	0
	Secondary	26	13	45	29	38	22	44	36
	None	74	87	55	71	62	78	56	64
Military Preparedness	Primary	35	35	0	7	0	0	8	0
	Secondary	50	48	71	57	38	22	49	36
	None	15	17	29	36	62	78	43	64
Military Ops (Combat)	Primary	0	0	0	0	0	0	0	0
	Secondary	15	22	0	0	25	0	15	9
	None	85	78	100	100	75	100	85	91
Polar Operations	Primary	0	0	0	0	75	77	0	0
	Secondary	0	0	0	0	0	11	13	0
	None	100	100	100	100	25	12	87	100
SAR	Primary	32	22	64	61	0	0	23	18
	Secondary	44	39	33	36	50	33	64	73
	None	24	39	3	3	50	67	13	9
Aids to Navigation	Primary	0	0	0	0	0	0	95	100
	Secondary	15	13	0	18	25	0	0	0
	None	85	87	100	82	75	100	5	0
Marine Science	Primary	9	0	0	0	25	22	0	0
	Secondary	59	57	24	25	50	44	28	9
	None	32	43	76	75	25	34	72	91
Ocean Station	Primary	41	30	0	0	13	0	0	0
	Secondary	21	22	0	0	0	13	13	0
	None	38	48	100	100	87	87	87	100

APPENDIX D - PART 1

QUESTIONNAIRE SECTION II - OPERATIONAL PERFORMANCE AND TRAINING ASSESSMENT

SECTION II, Question #1

This question directed that the officer, based on his experience, indicate the most effective training method for each of the various operational functions listed.

WHEC CO's - 84 Months Average Seagoing Experience

All CO's surveyed had experience with Training Teams/STD's and Refresher Training. Fifty percent (50%) indicated no experience with the Mobile Technical Units and this training method was not recommended as being effective for any operational functions. Similarly, 47% had no experience with Fleet operations and this was not recommended as a good training method. With respect to the primary choices, the WHEC CO's indicated a preference for the following Training Method/Operations Function combinations:

Training Teams & STD's	-	CIC Operations, SAR Operations
Mobile Technical Units	-	None
Training Availability	-	None
Simulators	-	ASW Operations
Refresher Training	-	Communications, Navigation, Ship Handling, Gunnery, Seamanship, Damage Control, Engineering
Multi-Unit, Joint Service Exercises	-	Air Helo Operations
Fleet (not exercises)	-	None
Fleet Exercises (ASWX)	-	None

WHEC XO's - 68 Months Average Seagoing Experience

All WHEC XO's indicated experience with Refresher Training while 96% had prior exposure to Training Teams. Forty-three percent (43%) had no prior experience with Mobile Technical Units and this training method was not recommended as being effective. The primary choice combinations recommended by WHEC XO's were:

Training Teams & STD's	-	SAR Operations
Mobile Technical Units	-	None
Training Availability	-	None
Simulators	-	ASW Operations, CIC Operations, Ship Handling

Refresher Training	-	Communications, Navigation, Gunnery, Seamanship, Damage Control, Engineering
Multi-Unit, Joint Services Exercises	-	None
Fleet (not exercises)	-	None
Fleet Exercises (ASWX)	-	None

WMEC CO's - 79 Months Average Seagoing Experience

This group indicated that 74 percent had no prior experience with Mobile Technical Units, approximately one-third (31%) were unfamiliar with Training Availability and half (50%) had no experience with fleet operations or exercises. Consequently none of these methods were selected as being an effective training approach. The resulting choice combinations recommended by WMEC CO's were:

Training Teams and STD's	-	CIC Operations, SAR Operations, Air Helo Operations
Mobile Technical Units	-	None
Training Availability	-	None
Simulators	-	ASW Operations, Ship Handling
Refresher Training	-	Communications, Navigation, Gunnery, Seamanship, Damage Control, Engineering
Multi-Unit, Joint Service Exercises	-	None
Fleet (not exercises)	-	None
Fleet Exercises (ASWX)	-	None

WMEC XO's - 60 Months Average Seagoing Experience

Sixty-four percent (64%) of these XO's had no experience with Mobile Technical Units. Forty-six percent (46%) had no Fleet operations experience and 68% indicated inexperience with Fleet (ASWX) exercises. Therefore, none of these were selected as effective training methods. The resulting choice combinations recommended by WMEC XO's were:

Training Teams & STD's	-	SAR Operations
Mobile Technical Units	-	None
Training Availability	-	None
Simulators	-	ASW Operations, CIC Operations
Refresher Training	-	Communications, Navigation, Ship Handling, Gunnery, Seamanship, Damage Control, Engineering
Multi-Unit, Joint Services Exercises	-	SAR Operations
Fleet (not exercises)	-	None
Fleet Exercises (ASWX)	-	ASW Operations

WAGB XO's - 74 Months Average Seagoing Experience

Here again, large ratios of personnel had no prior experience with Mobile Technical Units (78%), Fleet Operations (44%) and Fleet (ASWX) Exercises (56%). Only 11% were inexperienced with Training Teams & STD's. Choice combinations recommended by WAGB XO's were:

Training Teams & STD's	-	SAR Operations
Mobile Technical Units	-	None

Training Availability	-	Navigation
Simulators	-	ASW Operations, CIC Operations, Ship Handling
Refresher Training	-	Gunnery, Seamanship, Damage Control, Engineering
Multi-Unit, Joint Services Exercises	-	Air Helo Operations, Communications
Fleet (not exercises)	-	None
Fleet Exercises (ASWX)	-	None

<u>WLB CO's</u> - 70 Months Average Seagoing Experience

Greater than 75% of these CO's indicated no experience with Fleet activities or Mobile Technical Units. In addition, almost half (46%) were unfamiliar with Training Availability. Only one CO was not familiar with Training Teams and STD's. The choice combinations selected were:

Training Teams & STD's	-	SAR Operations, Communications
Mobile Technical Units	-	None
Training Availability	-	None
Simulators	-	ASW Operations, CIC Operations, Ship Handling
Refresher Training	-	Navigation, Gunnery, Seamanship, Damage Control, Engineering
Multi-Unit, Joint Service Exercises	-	Air Helo Operations
Fleet (not exercises)	-	None
Fleet Exercises (ASWX)	-	None

<u>WLB XO's</u> - 68 Months Average Seagoing Experience

Eighty percent (80%) or more of this group had no prior experience with Mobile Technical Units or Fleet activities. Sixty-six percent (66%) were unfamiliar with Training Availability. Actual choice combinations selected were:

Training Teams & STD's	-	SAR Operations
Mobile Technical Units	-	None

Training Availability	-	None
Simulators	-	ASW Operations, CIC Operations
Refresher Training	-	Communications, Navigation, Ship Handling, Gunnery, Seamanship, Damage Control, Engineering
Multi-Unit, Joint Service Exercises	-	Air Helo Operations
Fleet (not exercises)	-	None
Fleet Exercises (ASWX)	-	None

Conclusion

Training methods encompassed by: Mobile Technical Units, Training Availability and Fleet operations and exercises are unfamiliar to a significant quantity of the officers/billets surveyed. As a consequence, these methods were not selected as being effective for training and therefore the operational functions were allocated primarily to: Training Teams/STD's, Simulators, Refresher Training and Multi-Unit, Joint Service Exercises. Of these, Refresher Training was selected as the overall most effective training method and was consistently assigned the following functions:

Refresher Training	-	Communications, Navigation, Gunnery, Seamanship, Damage Control and Engineering. Ship Handling was evenly distributed between Refresher Training and Simulators.

Simulators were chosen for ASW and CIC Operations as well as Ship Handling.

Training Teams and STD's were selected almost unamously for teaching SAR Operations and in about 40% of these cases also for CIC Operations.

Multi-Unit exercises were exclusively assigned a single operational function; Air Helo Operations.

TABLE D1-7

TRAINING METHOD	% NO EXP[2]	ASW OPS	CIC OPS	SAR OPS	AIR HELO	COMM	NAV OPS	SHP HDL	GUN-NRY	SEA-MNSP	DMG CONT	ENG	OVERALL MOST EFFECT[4]
		84-MONTH SEAGOING EXPERIENCE - WHEC CO's - PERCENT SELECTION[1]											
Training Teams & STD's	0	-	32	57	32	14	14		-	-	-	-	
Mobile Tech Units	50	-	-	-	-	-	-		-	-	-	-	
Training Availablty	21	-	-	-	-	-	-	15	9	-	14	-	
Simulators	9	46	27	17	-	-	-	10	-	-	-	-	
Refresher Training	0	34	20	-	-	46	54	44	81	69	80	87	X
Multi-Unit Joint Services Exercise	6	-	14	23	43	17	14	26	-	17	-	-	
Fleet	47	-	-	-	-	-	-		-	-	-	-	
Fleet Exer (ASWX)	35	-	-	-	-	11	-		-	-	-	-	
	Note 3	68 Months Sea-going Experience WHEC XO's - PERCENT SELECTION[1]											
Training Teams & STD's	4	-	13	70	32	10	14	-	-	-	9	-	
Mobile Tech Units	43	-	-	-		-	-	-	-	-	-	-	
Training Availablty	22	-	-	-	11	10	-	9	-	-	23	14	
Simulators	4	46	56	17	-	-	14	35	-	-	9	-	
Refresher Training	0	19	17	-	11	38	64	17	76	57	59	76	X
Multi-Unit Joint Services Exercise	17	-	-	13	32	19	-	17	-	24	-	-	
Fleet	35	-	-	-	11	-	-	9	10	10	-	-	
Fleet Exer (ASWX	26	31	-	-	-	19	-	9	-	-	-	-	

Notes:
1. Dashes - in columns indicate insignificant percentage; thus, columns may not add to 100%.
2. Based on 34 surveys.
3. Based on 23 surveys.
4. X indicates the majority choice for overall most effective method.

TABLE D1-8

TRAINING METHOD	% NO EXP[2]	ASW OPS	CIC OPS	SAR OPS	AIR HELO	COMM	NAV OPS	SHP HDL	GUN-NRY	SEA-MNSP	DMG CON	ENG	OVERALL MOST EFFECT[4]
	79-MONTH SEAGOING EXPERIENCE - WMEC CO's - % SELECTION[1]												
Training Teams & STD's	2	-	42	56	38	15	27	-	-	-	14	-	
Mobile Technical Units	74	-	-	-	-	-	-	-	-	-	-	-	
Training Availability	31	-	-	12	14	20	11	13	-	10	14	15	
Simulators	7	45	23	-	-	-	-	36	-	-	-	-	
Refresher Training	7	26	23	-	-	40	49	23	88	43	70	68	X
Multi-Unit Joint Services Exercise	10	10	-	24	35	13	-	10	-	40	-	-	
Fleet	50	-	-	-	-	-	-	10	-	-	-	-	
Fleet Exercises (ASWX)	50	17	-	-	-	-	-	-	-	-	-	-	
	Note 3	60-MONTH SEAGOING EXPERIENCE - WMEC XO's PERCENT SELECTION[1]											
Training Teams & STD's	0	-	26	52	29	14	-	-	10	11	10	-	
Mobile Technical Units	64	-	-	-	-	-	-	-	-	-	-	-	
Training Availability	18	-	10	-	-	21	-	18	14	-	27	-	
Simulators	32	42	32	11	-	-	19	14	-	-	17	-	
Refresher Training	7	27	23	-	13	39	56	32	59	46	47	68	X
Multi-Unit Joint Services Exercise	21	-	-	26	33	-	-	-	-	25	-	-	
Fleet	46	-	-	-	-	-	-	25	-	14	-	-	
Fleet Exer (ASWX)	68	12	-	-	-	-	-	-	-	-	-	-	

Notes: 1. Dashes - in columns indicate insignificant percentage; thus, columns may not add to 100%.
2. Based on 42 surveys
3. Based on 28 surveys
4. X indicates the majority choice for overall most effective method.

TABLE D1-9

TRAINING METHOD	% NO EXP[2]	ASW OPS	CIC OPS	SAR OPS	AIR HELO	COMM	NAV OPS	SHP HDL	GUN-NRY	SEA MNSP	DMG CONT	ENG	OVERALL MOST EFFECT[4]
		83-MONTH SEAGOING EXPERIENCE--WAGB CO's PERCENT SELECTION[1]											
Training Teams & STD's	0	11	33	27	43	9	10	-	-	11	-	-	
Mobile Technical Units	63	-	-	-	14	-	-	-	-	-	-	14	
Training Availability	38	-	-	-	14	9	-	29	-	11	11	14	
Simulators	13	22	17	9	14	9	10	29	14	-	22	-	
Refresher Training	0	33	17	9	-	36	50	43	71	44	67	71	X
Multi-Unit Joint Services Exercise	13	-	25	36	14	18	10	-	-	22	-	-	
Fleet	25	-	9	18	-	9	10	-	-	11	-	-	
Fleet Exer (ASWX)	50	33	-	-	-	9	10	-	14	-	-	-	
	Note 3	74-MONTH SEAGOING EXPERIENCE WAGB XO's PERCENT SELECTION[1]											
Training Teams & STD's	11	-	11	57	43	-	-	-	-	-	-	14	
Mobile Technical Units	78	-	-	-	-	-	-	-	-	-	-	-	
Training Availability	22	-	11	-	-	25	43	13	-	29	11	14	
Simulators	22	50	45	14	-	-	29	75	-	-	22	-	
Refresher Training	11	25	11	-	-	25	29	13	86	71	67	71	X
Multi-Unit Joint Services Exercise	11	13	-	29	57	38	-	-	-	-	-	-	
Fleet	44	-	11	-	-	-	-	-	-	-	-	-	
Fleet Exer. (ASWX)	56	13	-	-	-	13	-	-	14	-	-	-	

Notes:
1. Dashes - in columns indicate insignificant percentage; thus, columns may not add to 100%.
2. Based on 8 surveys
3. Based on 9 surveys
4. X indicates the majority choice for overall most effective method.

TABLE D1-10

TRAINING METHOD	% NO EXP[2]	ASW OPS	CIC OPS	SAR OPS	AIR HELO	COMM	NAV OPS	SHP HDL	GUN-NRY	SEA MNSP	DMG CONT	ENG	OVERALL MOST EFFECT[4]
		70-MONTH SEAGOING EXPERIENCE--WLB CO's PERCENT SELECTION[1]											
Training Teams & STD's	3	-	31	56	-	38	34	-	14	23	19	28	
Mobile Technical Units	87	-	-	-	-	-	-	-	-	-	-	-	
Training Availability	46	-	-	-	14	-	-	10	17	-	14	-	
Simulators	28	58	44	9	9	17	9	37	-	-	14	10	
Refresher Training	18	17	-	-	9	17	43	30	62	42	52	62	X
Multi-Unit Joint Services Exercise	23	-	14	31	59	21	9	17	-	26	-	-	
Fleet	87	-	-	-	-	-	-	-	-	-	-	-	
Fleet Exer (ASWX)	74	-	-	-	-	--	-	-	-	-	-	-	
	Note 3	68-MONTH SEAGOING EXPERIENCE WLB XO's PERCENT SELECTION[1]											
Training Teams & STD's	0	-	15	50	17	-	18	-	-	18	17	-	
Mobile Technical Units	91	-	-	-	-	-	-	-	-	-	-	-	
Training Availability	66	-	-	-	-	20	-	13	11	-	17	-	
Simulators	27	42	54	-	-	10	18	-	-	-	-	-	
Refresher Training	0	33	23	-	17	40	55	38	89	45	58	91	X
Multi-Unit Joint Services Exercise	0	-	-	50	67	20	-	38	-	36	-	-	
Fleet	82	-	-	-	-	-	-	13	-	-	-	-	
Fleet Exer (ASWX)	82	-	-	-	-	10	-	-	-	-	-	-	

Notes:
1. Dashes - in columns indicate insignificant percentage; thus, columns may not add to 100%.
2. Based on 39 surveys
3. Based on 11 surveys
4. X indicates the majority choice for overall most effective method.

SECTION II, Question #2

This question required a qualitative indication of the effectiveness of team trainer-simulators identified as ASW Types 14A2 and 14A6 and CIC trainers STD Mobile Unit and Triple Threat Systems.

WHEC CO's

With an average of 84 months seagoing experience over the latest of four tours (in various cutter classes) these CO's rated the effectiveness of the 14A2 above normal by a majority of 60%. Only 9% rated the 14A2 normally effective or below. However, it should be noted that 32% of these CO's were unfamiliar with the trainer and had no opinion as to its effectiveness. Similarly, 31% of the WHEC CO's felt that the 14A6 was above normal in its training effectiveness and only 13% evaluated it as normal; none indicated a below normal level. However, 56% were unfamiliar with the device and had no opinion.

The STD Mobile CIC trainer was the most familiar device to all CO's and XO'x surveyed. Sixty percent (60%) of the WHEC XO's showed a higher than normal effectiveness rating for the unit and 15% rated it below normal. Only 6% indicated unfamiliarity. The Multi-Unit, Triple-Threat systems received a fair assessment with 43% of the WHEC CO's rating it at or above normal; 56% indicated unfamiliarity.

WHEC XO's

These personnel, who averaged 68 months at sea over latest four tours, responded in a manner similar to WHEC CO's with some variations. Fifty percent (50%) rated the 14A2 higher than normal and 36% were unfamiliar and had no opinion of its effectiveness. The 14A6 was judged normal or above by 40% of the XO's, while 57% had no experience with the device. All of the XO's were familiar with the STD unit and 22 had a below normal opinion of its effectiveness, while 35% thought it was exactly normal and 43% placed its effectiveness above normal. Fifty-four percent (54%) of these personnel assigned a higher than normal effectiveness to the Multi-Threat Trainer while 36% were unfamiliar and had no opinion of the device.

WMEC CO's

These personnel had an average 79 months experience at sea during latest four tours. Except for the STD Mobile CIC Trainer, with which only 7% of the CO's were unfamiliar, over 75% of the CO's were unfamiliar with the 14A2, 14A6 and Multi-Unit, Triple-Threat systems, respectively. With respect to the STD, 60% gave it a higher than normal effectiveness rating, 26% at exactly normal and 7% below normal.

WMEC XO

These personnel had an average 60 months experience at sea over their latest four tours. Greater than 80% of these XO's are unfamiliar with the 14A2, 14A6 and Multi-Unit, Triple-Threat systems while only 11% were unfamiliar with the STD Mobile Unit. With respect to this trainer, 36% judged its effectiveness as normal, while 47% placed it higher than normal.

WAGB

With an average 83 and 74 months of seagoing experience, respectively, both CO's and XO's were, as might be expected, unfamiliar with all of the training devices with the exception of the STD units. All of the WAGB CO's indicated familiarity with the STD and 25% thought its effectiveness to be below normal while a total of 38% placed it above normal and 38% were at exactly normal.

WLB

CO's and XO's averaged 70 and 68 months seagoing experience, respectively. Greater than 90% of the WLB CO's and XO's were unfamiliar with the 14A2, 14A6 and Multi-Unit systems. Although, in addition, 20-25% were also unfamiliar with the STD unit, approximately 60% placed its effectiveness higher than normal.

Conclusion

The 14A2 and 14A6 ASW simulators have little effective exposure with vessels and personnel other than the WHEC class. This is fundamental and to be expected. However, it is considered significant that one-third of the WHEC CO's and XO's are unfamiliar with the 14A2 and over half of this same group are unfamiliar with the 14A6. One-third of the WHEC XO's and over half of the CO's are not familiar with the Multi-Unit CIC trainers.

The STD CIC trainers, on the other hand, have broad and generally favorable exposure across the four cutter classes evaluated here. Of those surveyed, only WHEC XO's (13%) gave the STD's effectiveness a low rating, where 40% or more of the officers across all vessels thought that the STD training exceeded a normal rating.

Since a significantly high percentage of the officers who were familiar with the training devices examined feel that they provide a highly effective method of operational training, it is reasonable to suggest that their fellow officers who indicated a non-familiarity with these techniques would be benefited by exposure to such training courses.

TABLE D1-11

EFFECTIVENESS LEVEL	PERCENT OF TOTAL RESPONSES															
	WHEC CO				WMEC CO				WAGB CO				WLB CO			
	A2	A6	STD	MULT	A2	A6	STD	MULT	A2	A6	STD	MULT	A2	A6	STD	MULT
1. Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Below Normal	3	0	15	0	0	0	7	3	0	0	25	0	0	0	8	0
3. Normal	6	13	29	6	3	3	26	5	14	14	38	0	0	0	13	3
4. Above Normal	13	9	26	3	11	3	29	3	0	0	13	14	0	0	39	0
5. High	47	22	24	34	8	8	31	14	14	14	25	29	8	8	16	3
6. Unknown - No Opinion	32	56	6	56	78	86	7	76	71	71	0	57	92	97	24	95
	WHEC XO				WMEC XO				WAGB XO				WLB XO			
	A2	A6	STD	MULT	A2	A6	STD	MULT	A2	A6	STD	MULT	A2	A6	STD	MULT
1. Low	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0
2. Below Normal	0	5	9	5	0	0	7	4	0	0	0	0	0	0	0	0
3. Normal	14	10	35	5	11	0	36	0	13	14	44	14	0	0	20	0
4. Above Normal	18	5	39	18	4	4	29	11	13	0	22	14	0	0	60	10
5. High	32	24	4	36	4	8	18	4	0	0	22	0	11	0	0	10
6. Unknown - No Opinion	36	57	0	36	82	88	11	81	75	86	11	71	89	100	20	80

SECTION II, Question #3

This question requested the officer to rate his unit's readiness to perform; (a) all operational aspects of his assigned primary mission(s), and (b) all unique aspects of the same mission(s).

WHEC

CO - Listed primary missions as ELT, Military Preparedness, Search and Rescue and Ocean Station. In all cases, both for all and unique aspects, greater than 75 percent of these personnel indicated a greater than average readiness to perform the missions.

XO - These personnel listed the same primary missions as CO's and at least 75 percent judged their readiness to perform all aspects of each mission at above average. The same is true for the mission-unique aspects except for ELT where only 33 percent indicated above average readiness.

WMEC

CO - Listed primary missions as ELT and SAR. Seventy percent or higher felt their readiness to perform the overall aspects of these missions as above average. And while 91 percent felt above average for SAR, only 34 percent felt the same way for ELT. That is, 66 percent placed their ELT readiness at, or below average.

XO - Also listed ELT and SAR as primary. At least 70 percent of respondants showed a higher than average readiness to perform all aspects of both missions and greater than 50 percent showed higher than average readiness for the unique aspects of both missions.

WAGB

CO - Primary mission was Polar Operations and showed 67 percent above average readiness for all aspects and 50 percent for the unique aspects.

XO - Again, primary mission was Polar Operations and showed 100 percent above average readiness for all apsects and 57% for the unique aspects.

WLB

CO - Primary missions were SAR and Aids to Navigation. In all cases, for all and unique mission aspects, greater than 80 percent indicated an above average readiness to perform the missions.

XO - These personnel indicated Aids to Navigation as primary with 80 percent showing above average readiness for all aspects and 65 percent were above average for the unique aspects.

SECTION II, Question #9

This question required the officers to select a primary and secondary choice for a particular training method to be expanded to achieve increased training benefit to the U.S.C.G.

WHEC

CO - A slim majority of these officers chose Simulators then Refresher Training as primary and Training Teams & STD's and Training Availability, in that order, as secondary. Their cumulative selection (primary + secondary) resulted in a distribution in the following order of selection: Simulators, Training Availability, Training Teams & STD's, Refresher Training.

XO - A substantial majority (50%) chose Simulators ahead of Training Teams & STD's as primary and Training Teams & STD's and Multi-Unit Exercises, in that order, as secondary. Their cumulative selection resulted in a distribution in the following order of selection: Simulators, Training Teams & STD's, Refresher Training, and Multi-Unit Exercises.

WMEC

CO - Refresher Training and Training Teams & STD's were selected equally as primary followed by, also equally, Training Availability and Simulators. Their second choice was overwhelmingly Training Teams & STD's followed by Simulators and Multi-Unit Exercises, both equally selected. Their cumulative selection resulted in a distribution in the following order of selection: Training Teams & STD's, Refresher Training, Simulators and Training Availability.

XO - Simulators were selected over Refresher Training by a small margin for primary choice. Their secondary choice was Training Teams & STD's and Training Availability in that order. The cumulative selection resulted in a distribution in the following order of selection: Simulators, Training Teams & STD's, Training Availability and Refresher Training.

WAGB

CO - Over half selected Refresher Training as primary with an equal number selecting Simulators as secondary. The cumulative selection however resulted in the following order: Simulators, Refresher Training, Training Availability.

XO - These personnel selected Training Availability, by a wide margin, as primary selection. Their secondary selection was evenly split between Training Teams & STD's and Multi-Unit Exercises. Cumulative selection resulted in the following order: Training Availability, Training Teams & STD's and Multi-Unit Exercises.

WLB

CO - Training Teams & STD's were the primary selection followed equally by Simulators and Refresher Training. The overwhelming second choice was Training Teams & STD's followed by Simulators. Cumulative selections were in the following order: Training Teams & STD's, Simulators, Refresher Training.

XO - Again, Training Teams & STD's followed by Simulators were selected as primary choice. Second choice went to Training Availability and, equally, Training Team & STD's, Simulators and Multi-Unit Exercises. Cumulative selections were: Training Teams & STD's, Training Availability and Simulators.

TABLE D1-12

	PERCENT CHOICE SELECTION												PERCENT CHOICE SELECTION											
	CO's LATEST TOUR (#1)												XO's LATEST TOUR (#1)											
	WHEC (32)			WMEC (41)			WAGB (7)			WLB (39)			WHEC (22)			WMEC (27)			WAGB (9)			WLB (11)		
	Pri	Sec	Cum	Pri	Sec	Cum	Pri	Sec	Cum	Pri	Sec	Cum	Pri	Sec	Cum	Pri	Sec	Cum	Pri	Sec	Cum	Pri	Sec	Cum
1. Training Teams - STD's	9	28	19	24	37	30	14	0	7	36	41	38	23	18	20	15	30	22	11	33	22	36	18	27
2. Mobile Technical Units	3	0	-	2	2	2	0	0	0	0	3	-	0	9	5	0	4	2	0	0	0	0	9	5
3. Training Availability	19	19	19	20	12	16	14	29	21	15	10	13	4	14	9	19	26	22	67	22	44	18	27	23
4. Simulators	31	13	22	20	17	18	14	57	35	23	26	24	50	5	27	37	11	24	11	11	11	27	18	23
5. Refresher Training	22	13	17	24	15	20	57	0	29	23	10	17	14	14	14	30	11	20	11	0	6	9	9	9
6. Multi-Unit Joint Services Exercise	16	13	14	9	17	13	0	14	7	3	10	6	9	18	14	0	11	6	0	33	17	9	18	14
7. Fleet (Not exercises)	0	3	-	0	0	0	0	0	0	0	0	0	0	14	7	0	7	4	0	0	0	0	0	0
8. Fleet Exercise (ASWX)	0	13	6	0	0	0	0	0	0	0	0	0	0	9	5	0	0	0	0	0	0	0	0	0

SECTION II, Question #10

This question requested that, out of eleven operational functions the officer select and rank five that continually cause difficulty. The survey data was analyzed but was restricted to the three most critical selections and also identified the three least critical. The results are given below.

WHEC CO

The selected operation that was most critical was Damage Control. Distribution of the first rank of severity (most severe) is: Damage Control, ASW Operations, Communications, Gunnery.

The operation selected as second in severity was Gunnery. Distribution of the second rank of serverity is: Gunnery, CIC Ops., ASW Ops., Communications. The operation selected as third in severity was also Gunnery. Distribution of the third rank of severity is: Gunnery, CIC Ops., Deck Seamanship, ASW Ops., and Damage Control.

The least severe operational functions, in the opinion of the WHEC CO's is SAR Ops., Shiphandling and Air Helo Ops.

WHEC XO

The selected operation that was most critical to this group was Damage Control and Communications (both were equally selected). Distribution of the first rank of severity (most severe) is: Damage Control/Communications, Gunnery and ASW Ops.

The operation selected as second in severity was CIC Ops. Distribution of the second rank of severity is: CIC Ops., ASW Ops., Bridge/Nav. Ops and Communications/Gunnery.

The operation selected as third in severity was an equal combination of ASW Ops., CIC Ops. and Communications. Distribution of the third rank of severity is: ASW Ops., CIC Ops., Communications, Gunnery.

The least severe operational functions, in the opinion of the WHEC XO's is Engineering, SAR Ops and Air Helo Ops.

WMEC CO

The selected operation that was most critical was Damage Control. Distribution of the first rank of severity (most severe) is: Damage Control, ASW Ops., Communications.

The operation selected as second in severity was Gunnery. Distribution of the second rank of severity is: Gunnery, Communications, CIC ops., Damage Control.

The operation selected as third in severity was Bridge/Nav. Ops. Distribution of the third rank of severity is: Bridge/Nav. Ops., Communictions, ASW Ops., CIC Ops., Gunnery.

The least severe operational functions, in the opinion of the WHEC CO's, is SAR Ops., Air Helo Ops., and Shiphanding.

WMEC XO

The selected operation that was most critical was Damage Control. Distribution of the first rank of severity (most severe) is: Damage Control, CIC Ops., Gunnery, ASW Ops.

The operation selected as second in severity was also Damage Control. Distribution of the second rank of severity is: Damage Control, Bridge/Nav. Ops., ASW Ops., Gunnery/Engineering.

The operation selected as third in severity was Gunnery. Distribution of the third rank of severity is: Gunnery, Communications, Desk Seamanship, CIC Ops./Engineering.

The least severe operational functions, in the opinion of the WMEC XO's, is Shiphandling, SAR Ops., Air Helo Ops.

WAGB CO

The selected operation that was most critical was Damage Control. Distribution of the first rank of severity (most severe) is: Damage Control, ASW Operations, Shiphandling.

The operation selected as second in severity was Engineering. Distribution of the second rank of severity is: Engineering, Bridge/Nav. Ops., CIC Ops., ASW Ops.

The operation selected as third in severity was CIC Ops. The distribution of the third rank of severity is: CIC Ops., Gunnery, Communications, ASW Ops.

The least severe operational functions, in the opinion of the WAGB CO's, is: Deck Seamanship, Shiphandling, Air Helo Ops.

WAGB XO

The selected operation that was most critical was Damage Control. Distribution of the first rank of severity (most severe) is: Damage Control, Shiphandling, SAR Ops., ASW Ops., Communications.

The operation selected as second in severity was Communications. Distribution of the second rank of severity is: Communications, Bridge/Nav. Ops., Air Helo Ops. CIC Ops., ASW Ops.

The operation selected as third in severity was CIC Ops. Distribution of the third rank of severity is: CIC Ops., Shiphandling, ASW Ops., Gunnery.

The least severe operational function, in the opinion of the WAGB XO's, is Air Helo Ops., Deck Seamanship, Engineering.

WLB CO AND XO

These billets are combined and the results summarized since these opinions, particularly with respect to ASW, CIC, etc. may not be based on first hand experience.

The most critical operations selected by both groups were distributed as follows: Damage Control, ASW Ops., Communications.

The second most severe operations selected by both groups were distributed as follows: Birdge/Nav. Ops., CIC Ops., ASW Ops., Damage Control.

The third most severe operations selected by both groups were distributed as follows: Communications, CIC Ops., Engineering, Gunnery.

SECTION II, Question #12

"What is optimum seagoing tour length (in months) to balance on-board experience and career development?"

The following table presents the average length selected by each billet/vessel.

TABLE D1-13. AVERAGE LENGTH TOUR

VESSEL	CO	XO
WHEC	30 Months	26 Months
WMEC	27 Months	29 Months
WAGB	29 Months	29 Months
WLB	30 Months	28 Months
Overall Average	29 Months	28 Months

SECTION II, Question #13

"How much do personnel transfer and assignment policies affect team performance and skill development?"

Five levels of response were possible: Very Little, Little, Nominal, Much and Very Much.

Responses in the highest level categories, Much and Very Much were summarized by Billet/Vessel combination and ratios taken. The results are given in the following table.

TABLE D1-14. RESPONSES SUMMARY

VESSEL	CUMULATIVE % INDICATIONS FOR "MUCH" AND "VERY MUCH"	
	CO	XO
WHEC	91%	91%
WMEC	95%	93%
WAGB	88%	89%
WLB	87%	91%

TABLE D1-15. ALLOCATION OF DIFFICULTY RANKING BY CUTTER TYPE

	ALLOCATION (%) OF DIFFICULTY RANKING *															
	WHEC, CO				WMEC, CO				WAGB, CO				WLB, CO			
OPERATIONAL FUNCTIONS	1	2	3	L	1	2	3	L	1	2	3	L	1	2	3	L
ASW Ops	18	12	12		12	7	17		38	13	13		0	17	6	X
CIC Ops	9	15	18		2	14	12		0	13	50		6	6	9	
SAR Ops	0	3	6	X	2	2	2	X	0	0	0		9	6	6	
Air/Helo Ops	0	3	3	X	0	0	0	X	0	0	0	X	3	0	9	X
Communications	12	12	9		10	17	17		0	0	13		20	14	14	
Bridge/Nav Ops	3	6	0		2	5	29		0	25	0		9	26	9	
Ship Handling	3	0	0	X	0	5	0	X	13	0	0	X	3	0	6	
Gunnery	12	30	24		7	31	10		0	0	25		6	14	9	
Deck Seamanship	0	6	18		0	2	2		0	0	0	X	0	3	9	X
Damage Control	39	6	12		62	12	7		50	13	0		43	9	9	
Engineering	3	6	0		2	5	5		0	38	0		3	6	14	
	WHEC, XO				WMEC, XO				WAGB, XO				WLB, XO			
	1	2	3	L	1	2	3	L	1	2	3	L	1	2	3	L
ASW Ops	9	17	17		11	14	4		14	14	14		36	36	9	
CIC Ops	4	30	17		25	7	11		0	14	43		9	36	27	
SAR Ops	0	4	0	X	4	0	7	X	14	0	0		0	0	9	X
Air/Helo Ops	0	4	4		0	0	0	X	0	14	0	X	0	0	0	X
Communications	30	9	17		4	7	14		14	43	0		9	0	0	
Bridge/Nav Ops	0	13	4		7	21	11		0	14	0		9	0	9	
Ship Handling	4	4	4		0	4	4	X	14	0	14		0	0	0	X
Gunnery	22	9	13		14	11	18		0	0	14		9	9	18	
Deck Seamanship	0	0	4		0	0	14		0	0	0	X	0	0	9	
Damage Control	30	4	9		36	25	7		43	0	0		27	18	9	
Engineering	0	4	9	X	0	11	11		0	0	14	X	0	0	9	

* Column 1 are those selected as most severe; column 3 is nominal severity (columns 4 and 5 not shown). Column L indicates the 3 functions considered least difficult.

SECTION II, Question #14

This question required the officer to estimate the segment of their crew, by department, that was in the learning cycle defined as not being able to reliably complete all functions within their duty assignment.

CO's - All CO's, across four types of vessels: WHEC, WMEC, WAGB and WLB concurred in the basic order of departmental trainee content. That is, all rated the Operations Department as having the lowest percentage of personnel in the learning cycle, and all were within the narrow range 27% to 40%. The Engineering Department was the next level with an indicated segment of trainees ranging from 33% to 40%. The Department with the highest portion of personnel in the training cycle was Deck/Weapons with numbers ranging from 45% to 54%.

XO's - These personnel with similar cutter experiences as the previous CO's, were also in agreement on the basic order of the trainee content within departments, i.e., Operations, Engineering and Deck/Weapons from least to highest. For the Operations Department, the indicated portion of its personnel in the training cycle varied between 31% and 37%. For Engineering the spread was 32% to 40% and for Deck/Weapons the numbers ranged from 43 to 50%.

Based on the foregoing assessments by CO's and XO's of WHEC, WMEC, WAGB and WLB cutters, it may generally be stated that one-third of Operations personnel are in training, forty percent of the typical Engineering Departments are in training and half of the Deck/Weapon personnel are trainees. WLB CO's indicated that their three departments--Operations, Engineering and Deck--taken together, had the highest allocation of trainee personnel with WHEC CO's rating their departments the next highest. WAGB CO's showed, across all three departments, the lowest allocation of personnel in the training cycle. However, in the opinion of WAGB XO's, the three departments had the highest allocation of trainees and WLB XO's showed the lowest level of trainees across all departments. Thus, in terms of the relation magnitudes of trainee allocation across all three departments, CO's and XO's from WLB's and WAGB's indicated directly opposite conclusions. To summarize, WLB CO's had highest overall allocation while WLB XO's had the lowest or least allocation of personnel in training. Further, WAGB CO's rated their departments as having the least allotment of trainees while WAGB XO's rated their similar departments the highest.

There was no indication of the cause of this disparity between these two billets from similar class cutters.

TABLE D1-16. AVERAGE PERCENT IN TRAINING BY DEPARTMENT

DEPARTMENT	AVERAGE PERCENT IN TRAINING							
	WHEC CO(34)	WMEC CO(42)	WAGB CO(8)	WLB CO(39)	WHEC XO(23)	WMEC XO(28)	WAGB XO(9)	WLB XO(11)
Operations	36	33	27	40	33	35	37	31
Engineering	40	37	33	40	34	36	40	32
Deck/Weapons	50	45	45	54	45	50	47	43
Absolute Total	126	112	105	134	112	121	124	106

SECTION II, Question #15

This question is a follow-on from the previous one (#14) and further details the experience status of personnel within the Operations Department as assigned to the following Divisions: Navigation, CIC/ASW and Communications. In addition, the allocation of personnel still in the training cycle is separated for officers and crewmen.

CO's - Officers

CO's with experience on WHEC, WMEC, WAGB and WLB class cutters rated the officers assigned to Navigation, CIC/ASW and Communications Divisions by indicating the ratio considered to be in training. WHEC CO's said that greater than 50 percent of the officers in all three divisions were in the learning cycle. WMEC CO's indicated that only slightly less than 50 percent of their officers in Nav, CIC and COMM were learning. WAGB CO's placed one-third of the officers in Navigation and Communications in the learning phase while greater than 60 percent of the officers in these same two divisions aboard WLB's were indicated as being trained.

Enlisted

WHEC CO's generally indicated that one-third of the enlisted personnel in NAV, CIC/ASW and COMM were in a training cycle. WMEC CO's put one-third of the enlisted personnel, within the NAV and COMM divisions, in the training category as well as 42 percent of the CIC/ASW personnel. WAGB CO's determined that less than 30 percent of the NAV and COMM enlisted personnel were trainees and WLB CO's estimated 40 percent of their NAV and COMM personnel were in training.

To summarize, CO's across all cutter classes evaluated, established that there was a larger proportion of officers in the training cycle then enlisted personnel within all three divisions--Navigation, CIC/ASW, Communications.

XO's - Officers

XO's with experience on WHEC, WMEC, WAGB and WLB class cutters rated the officers assigned to Navigation, CIC/ASW and Communications by indicating the ratio in training.

WHEC XO's put a minimum of 50 percent of the officers in each Division in the training cycle. WMEC XO's did likewise except for Navigation which was rated at only 42 percent training content. WAGB XO's indicated that approximately 40 percent of their officers in NAV and COMM were in training. The WLB XO's showed 45 percent and 55 percent of officers in training within the NAV and COMM divisions, respectively.

XO's - Enlisted

WHEC XO's showed that less than 40 percent of the enlisted crewmen in the NAV, CIC/ASW and COMM divisions were in training. Actual estimate for the COMM division was 26 percent. WMEC XO's placed a higher proportion of the NAV and CIC/ASW division crewmen in the learning cycle, 44 percent and 50 percent, respectively. The COMM division was listed at 38 percent. WAGB XO's reported 38 percent and 32 percent, respectively, of enlisted in the NAV and COMM division in the training cycle. WLB XO's for the same two divisions estimated 30 percent and 26 percent respectively.

In summary, XO's across all cutter classes evaluated, established that there was a significant proportion of officers in the training cycle. In all cases the officer proportion exceeded the enlisted proportion.

A general conclusion would establish that on a typical WHEC and WMEC over half of the officers and approximately one-third of the crew in the Operations Department are in the training cycle. In fact, the WHEC estimates for officer personnel in training, are, taking all three Operations Divisions together, the highest allocation of all cutter class types.

TABLE D1-17. AVERAGE PERCENT IN TRAINING BREAKDOWN

OPERATIONS DIVISIONS	AVERAGE PERCENT IN TRAINING															
	WHEC CO(34)		WMEC CO(42)		WAGB CO(8)		WLB CO(39)		WHEC XO(23)		WMEC XO(28)		WAGB XO(9)		WLB XO(11)	
	Off.	Crew	Off.	Crew	Off.	Crew	Off.	Crew	Off.	Crew	Off.	Crew	Off.	Crew	Off.	Crew
Navigation	56	37	49	34	33	27	75	39	49	38	42	44	42	38	45	30
CIC/ASW	61	35	46	42	45	35	52	46	60	35	55	50	59	50	49	47
Communications	53	31	48	33	33	22	61	43	56	26	57	38	43	32	55	26
Absolute Total	170	103	143	109	111	84	188	128	165	99	154	132	144	120	149	103
Rank Order	2	7	3	6	5	8	1	4	1	8	2	5	4	6	3	7

SECTION II, Question #16

The analysis performed for this question was somewhat complex in that certain preliminary criteria were used to separate out the most significant responses.

Question #16 itself required the officer to first indicate it, for his latest tour, a particular mission was primary (P) or secondary (S) and then to rate, on a scale of 1 to 5, his unit's readiness to perform the mission. However, before tabulating the responses to this question, the program interrogated Section I, Question #10, then matched the responses to the indicated missions in Section II, Question #16.

Those missions, for which a significant number of respondees had PRIMARY responsibility, were ELT, Military Preparedness, Polar Operations, Search and Rescue, and Aids to Navigation. For the others, there was -0- or an insignificant assignment of PRIMARY responsibility. Thus, it may be stated, for major class cutters that the foregoing missions are the primary missions of the Coast Guard, and all others are SECONDARY.

The results of this analysis for these primary missions is as follows: All CO's and XO's rated their readiness to perform their primary mission(s) at above average. Eighty percent of WHEC CO's and XO's rated their readiness to perform ELT, Military Preparedness and SAR at above average. For ELT and SAR missions, over 90 percent of WMEC CO's rated their readiness at above average, while 75 percent of WMEC XO's indicated an above-average readiness.

WAGB CO's and XO's indicated a single PRIMARY mission of Polar Operations which was rated by 75 percent as above average readiness.

Similarly, 93 percent of WLB CO's rated their readiness for Aids to Navigation at above average.

The number of WHEC XO's responding to SAR and the number of WLB XO's responding to Aids to Navigation (three in both cases) is minimal and, therefore, insignificant.

TABLE D-18. PRIMARY MISSIONS AND DISTRIBUTION OF ASSIGNED LEVELS OF READINESS

PRIMARY MISSION*	LEVEL**	WHEC CO	WHEC XO	WMEC CO	WMEC XO	WAGB CO	WAGB XO	WLB CO	WLB XO
ELT		P = 19	P = 14	P = 21	P = 15				
	1	0	0	0	0	N/A		N/A	
	2	0	0	0	0				
	3	11	7	0	27				
	4	42	36	24	27				
	5	47	57	76	47				
MILITARY PREPAREDNESS		P = 10	P = 7						
	1	0	0	N/A		N/A		N/A	
	2	20	0						
	3	0	14						
	4	40	29						
	5	40	57						
POLAR OPERATIONS						P = 4	P = 4		
	1	N/A		N/A		0	25	N/A	
	2					0	25		
	3					25	25		
	4					0	0		
	5					75	25		
SEARCH AND RESCUE		P = 9	P = 3	P = 12	P = 9				
	1	0	0	0	0	N/A		N/A	
	2	0	0	8	11				
	3	0	33	0	11				
	4	0	0	17	22				
	5	100	67	75	56				
AIDS TO NAVIGATION								P = 14	P = 3
	1	N/A		N/A		N/A		0	0
	2							0	33
	3							7	0
	4							14	0
	5							79	67

* Responses were -0- or insignificant for Primary Missions: Domestic Icebreaking, Marine Environmental Protection, Military Operations (Combat), Marine Science Activities.

** 1 = low level; 3 = nominal; 5 = high level of readiness.

SECTION II, Question #16

Primary Missions and Distribution of Assigned Levels of Readiness

SUMMARY

WHEC

CO's - 89% above average readiness for ELT
80% above average readiness for Military Preparedness
100% above average readiness for SAR

XO's - 93% above average readiness for ELT
86% above average readiness for Military Preparedness
67% above average readiness for SAR

WMEC

CO's -100% above average readiness for ELT
92% above average readiness for SAR

XO's - 74% above average readiness for ELT
78% above average readiness for SAR

WAGB

CO's - 75% above average readiness for Polar Ops

XO's - 25% above average readiness for Polar Ops

WLB

CO's - 93% above average readiness for Aids to Navigation

XO's - 67% above average readiness for Aids to Navigation

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A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY--ETC(U)
APR 77 D W HANNA, E W BOYLE, J F DESPANTZ DOT-CG-61814A
UNCLASSIFIED 3M080 USCG-C-1-77 NL

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APPENDIX D

PART 2: DATA REDUCTION AND ANALYSES OF QUESTIONNAIRE SECTIONS I, II AND III

APPENDIX - PART 2

QUESTIONNAIRE SECTION I - BACKGROUND INFORMATION

APPENDIX D - PART 2

QUESTIONNAIRE SECTION I - BACKGROUND INFORMATION

Question 5 - Years Commissioned

The respondents' mean years of commissioned service is about 16, with over 93% having more than 10 years service. Table D2-1 shows the year of commissioning for each of the respondents.

TABLE D2-1. RESPONDENTS' YEAR COMMISSIONED

YEAR COMMISSIONED AND NUMBER OF OFFICERS

YEAR	QUANTITY
1943	001
1948	001
1949	004
1950	006
1951	005
1952	004
1953	004
1954	005
1955	008
1956	014
1957	015
1958	012
1959	015
1960	012
1961	021
1962	013
1963	017
1964	022
1965	019
1966	020
1967	007
1969	004
1970	002
1972	002
1973	001

Question 6 - Post Graduate Training

About half the officers queried have some form of graduate training. The code denoting the nature of that training refers to the listing on Page XI of CG-III.

Table D2-2 shows, without regard to billet or vessel, the number and percentage of all respondents with each type of advanced training.

TABLE D2-2. PERCENTAGE OF SURVEY GROUP WITH ADVANCED TRAINING

NUMBER OF OFFICERS SURVEYED= 235

NUMBER OF OFFICERS WITH SPECIAL TRAINING CODE=116
NUMBER OF OFFICERS WITHOUT SPECIAL TRAINING CODE=117
NUMBER OF OFFICERS NOT ANSWERING QUESTION 6=002

SPECIAL TRAINING CODE REDUCTION

CODE	QUANTITY	WITH CODE %	TOTAL %
01	016	13.79	06.80
05	007	06.03	02.97
06	007	06.03	02.97
07	003	02.58	01.27
10	001	00.86	00.42
11	002	01.72	00.85
12	001	00.86	00.42
14	002	01.72	00.85
16	003	02.58	01.27
17	002	01.72	00.85
19	012	10.34	05.10
21	003	02.58	01.27
22	002	01.72	00.85
23	003	02.58	01.27
25	001	00.86	00.42
26	001	00.86	00.42
29	007	06.03	02.97
30	001	00.86	00.42
34	021	18.10	08.93
39	005	04.31	02.12
41	001	00.86	00.42
52	002	01.72	00.85
54	001	00.86	00.42
55	002	01.72	00.85
56	002	01.72	00.85
57	002	01.72	00.85
59	001	00.86	00.42
60	003	02.58	01.27
62	002	01.72	00.85

Question 7 - Four Most Recent PCS Assignments Afloat

The average length of respondents' four most recent tours is 18 months. Table D2-3 shows the average tour length for each of the four tours.

TABLE D2-3. AVERAGE TOUR LENGTH

TOUR NO.	AVERAGE TOUR
1	20 MONTHS
2	20 MONTHS
3	17 MONTHS
4	14 MONTHS

Question 8 - Weeks of Special or Advanced Formal Training in Conjunction with Last Four Tours.

Table D2-4 presents the average weeks of formal training received in eleven specific task areas plus the lumped total in "other" areas received during each officer's last four PCS assignments afloat. It will be seen that the total formal training during each tour is a little over two weeks.

TABLE D2-4. AVERAGE WEEKS OF FORMAL TRAINING - LAST FOUR TOURS

AVERAGE WEEKS OF TRAINING BASED ON 235 SURVEYS.

TRAINING COURSE	TOUR #1	TOUR #2	TOUR #3	TOUR #4	TOTAL
ASW------------	0.33	0.25	0.28	0.48	1.361
CIC------------	0.28	0.15	0.23	0.28	0.965
NAV------------	0.07	0.08	0.08	0.06	0.306
SAR------------	0.14	0.12	0.14	0.16	0.582
WEAPONS--------	0.10	0.06	0.13	0.06	0.374
HELO OPS-------	0.16	0.05	0.00	0.00	0.217
SHIP HANDLING--	0.11	0.06	0.09	0.07	0.357
COMM-----------	0.03	0.04	0.14	0.21	0.438
ENG------------	0.09	0.06	0.07	0.08	0.310
RULES OF ROAD--	0.18	0.08	0.13	0.10	0.502
DAMAGE CONTROL-	0.18	0.38	0.38	0.25	1.212
OTHER----------	0.52	0.62	0.46	0.31	1.936
TOTAL	02.2	02.0	02.1	02.1	AVG WKS TRNG/TOUR

Question 9 - Type of Operational Training by Tour.

Table D2-5 shows the number of respondents who participated in eight types of operational training in connection with their four most recent tours afloat. Highest participation was in Training Teams and STD's, C.G. Multi-Unit Exercises and REFTRA with relatively little experience in Shakedown Training, Mobile Technical Units and Fleet Exercises.

TABLE D2-5. OPERATIONAL TRAINING PARTICIPATION

OPERATIONAL TRAINING	PARTICIPATE YES	NO	TOUR NUMBER 1	2	3	4	NO ANS
TRAINING TEAMS & STDS	219	009	174	145	124	103	007
MOBILE TECHNICAL UNITS	038	138	041	013	002	001	059
TRAINING AVAILABILITY	125	069	093	053	036	023	041
REFRESHER TRAINING	194	018	154	104	073	070	023
SHAKEDOWN TRAINING	033	147	017	015	008	005	055
C.G.MULTI-UNIT EXER.	202	013	160	155	132	099	020
JOINT OPERATIONAL EXER.	081	104	041	033	026	025	050
FLEET EXERCISES (ASWEX)	061	124	036	008	017	014	050

NUMBER OF OFFICERS SURVEYED= 235

Question 10 - Primary and Secondary Mission Assignments of Recent Tours

This question requested the officer to indicate those missions he considered primary and those considered secondary on each of his four latest tours afloat.

Summarizing the responses of the entire group without regard to rank, billet, vessel or tour number (Table D2-6) shows that most importance of the twelve missions listed is given to Search and Rescue with 43% of the respondents assigning it primary or secondary priority. This is followed by Enforcement of Laws and Treaties (ELT) with 27%, Military Preparedness 25%, Aids to Navigation 23% and Ocean Station 19% of respondents assigning primary or secondary importance to them. It is interesting to note that while Military Preparedness ranks very low in primary importance (7%), it is given the highest response as a secondary mission assignment. The tables which follow present a breakdown of the responses by rank and tour number.

TABLE D2-6. MISSION ASSIGNMENTS OF RECENT TOURS - ALL RANKS

NUMBER OF OFFICERS SURVEYED= 235

MISSION	TOUR 1	TOUR 2	TOUR 3	TOUR 4	TOTAL	% OF TOTAL
ENFORCEMENT OF L&T---	PRI 094	PRI 025	PRI 016	PRI 018	153	12.3
	SEC 083	SEC 088	SEC 096	SEC 064	331	14.4
QUESTION NOT ANSWERED	058	122	123	153		
DOMESTIC ICEBREAKING-	PRI 014	PRI 009	PRI 003	PRI 006	032	2.6
	SEC 032	SEC 038	SEC 028	SEC 031	129	5.6
QUESTION NOT ANSWERED	189	188	204	198		
MARINE ENVIRON.PROT.	PRI 002	PRI 000	PRI 000	PRI 000	002	0.2
	SEC 074	SEC 047	SEC 032	SEC 032	185	8.0
QUESTION NOT ANSWERED	159	188	203	203		
MILITARY PREPAREDNESS	PRI 028	PRI 029	PRI 022	PRI 014	093	7.5
	SEC 117	SEC 098	SEC 105	SEC 093	413	17.9
QUESTION NOT ANSWERED	090	108	108	128		
MILITARY OPS (COMBAT)	PRI 002	PRI 039	PRI 023	PRI 008	072	5.8
	SEC 029	SEC 026	SEC 022	SEC 020	097	4.2
QUESTION NOT ANSWERED	204	170	190	207		
POLAR OPERATIONS-----	PRI 017	PRI 017	PRI 016	PRI 010	060	4.8
	SEC 015	SEC 011	SEC 009	SEC 011	046	2.0
QUESTION NOT ANSWERED	203	207	210	214		
SEARCH AND RESCUE----	PRI 080	PRI 074	PRI 087	PRI 070	311	25.0
	SEC 114	SEC 116	SEC 102	SEC 080	412	17.9
QUESTION NOT ANSWERED	041	045	046	085		
AIDS TO NAVIGATION---	PRI 060	PRI 077	PRI 059	PRI 042	238	19.1
	SEC 020	SEC 018	SEC 027	SEC 027	092	4.0
QUESTION NOT ANSWERED	155	140	149	166		
MARINE SCIENCE ACT.--	PRI 012	PRI 010	PRI 005	PRI 005	032	2.6
	SEC 082	SEC 086	SEC 066	SEC 046	280	12.2
QUESTION NOT ANSWERED	141	139	164	184		
OCEAN STATION--------	PRI 030	PRI 051	PRI 050	PRI 068	199	16.0
	SEC 020	SEC 016	SEC 015	SEC 009	060	2.6
QUESTION NOT ANSWERED	185	168	170	158		
TRAINING-------------	PRI 011	PRI 009	PRI 009	PRI 002	031	2.5
	SEC 067	SEC 062	SEC 053	SEC 049	231	10.0
QUESTION NOT ANSWERED	157	164	173	184		
OTHER----------------	PRI 006	PRI 005	PRI 008	PRI 003	022	1.8
	SEC 009	SEC 007	SEC 005	SEC 004	025	1.1
QUESTION NOT ANSWERED	220	223	222	228		

TABLE D2-7. MISSION ASSIGNMENTS OF RECENT TOURS - CAPTAINS

NUMBER OF CAPTAINS SURVEYED= 042

MISSION	TOUR 1	2	3	4	TOTAL	% OF TOTAL
ENFORCEMENT OF L&T---	PRI 020	PRI 004	PRI 002	PRI 003	029	12.6
	SEC 010	SEC 015	SEC 020	SEC 011	056	12.6
QUESTION NOT ANSWERED	012	023	020	028		
DOMESTIC ICEBREAKING-	PRI 001	PRI 001	PRI 001	PRI 001	004	1.7
	SEC 003	SEC 005	SEC 007	SEC 010	025	5.6
QUESTION NOT ANSWERED	038	036	034	031		
MARINE ENVIRON.PROT.	PRI 000	PRI 000	PRI 000	PRI 000	000	---
	SEC 011	SEC 008	SEC 005	SEC 004	028	6.3
QUESTION NOT ANSWERED	031	034	037	038		
MILITARY PREPAREDNESS	PRI 010	PRI 007	PRI 003	PRI 001	021	9.1
	SEC 021	SEC 019	SEC 019	SEC 025	084	19.0
QUESTION NOT ANSWERED	011	016	020	016		
MILITARY OPS (COMBAT)	PRI 001	PRI 004	PRI 001	PRI 000	006	2.6
	SEC 005	SEC 007	SEC 004	SEC 004	020	4.5
QUESTION NOT ANSWERED	036	031	037	038		
POLAR OPERATIONS-----	PRI 006	PRI 006	PRI 004	PRI 002	018	7.8
	SEC 002	SEC 002	SEC 002	SEC 002	008	1.8
QUESTION NOT ANSWERED	034	034	036	038		
SEARCH AND RESCUE----	PRI 015	PRI 015	PRI 014	PRI 010	054	23.5
	SEC 014	SEC 015	SEC 017	SEC 016	062	14.0
QUESTION NOT ANSWERED	013	012	011	016		
AIDS TO NAVIGATION---	PRI 000	PRI 008	PRI 013	PRI 013	034	14.8
	SEC 006	SEC 005	SEC 004	SEC 006	021	4.7
QUESTION NOT ANSWERED	036	029	025	023		
MARINE SCIENCE ACT.--	PRI 004	PRI 003	PRI 003	PRI 002	012	5.2
	SEC 022	SEC 019	SEC 014	SEC 008	063	14.2
QUESTION NOT ANSWERED	016	020	025	032		
OCEAN STATION--------	PRI 012	PRI 013	PRI 007	PRI 015	047	20.4
	SEC 006	SEC 004	SEC 003	SEC 002	015	3.4
QUESTION NOT ANSWERED	024	025	032	025		
TRAINING-------------	PRI 001	PRI 001	PRI 000	PRI 000	002	0.9
	SEC 018	SEC 015	SEC 012	SEC 011	056	12.6
QUESTION NOT ANSWERED	023	026	030	031		
OTHER----------------	PRI 000	PRI 000	PRI 003	PRI 000	003	1.3
	SEC 000	SEC 001	SEC 002	SEC 002	005	1.1
QUESTION NOT ANSWERED	042	041	037	040		

TABLE D2-8. MISSION ASSIGNMENTS OF RECENT TOURS - COMMANDERS

NUMBER OF COMMANDERS SURVEYED= 084

MISSION	TOUR 1	2	3	4	TOTAL	% OF TOTAL
ENFORCEMENT OF L&T---	PRI 043	PRI 014	PRI 008	PRI 008	073	16.4
	SEC 025	SEC 026	SEC 028	SEC 021	100	13.1
QUESTION NOT ANSWERED	016	044	048	055		
DOMESTIC ICEBREAKING-	PRI 005	PRI 002	PRI 001	PRI 002	010	2.2
	SEC 006	SEC 012	SEC 009	SEC 007	034	4.5
QUESTION NOT ANSWERED	073	070	074	075		
MARINE ENVIRON.PROT.	PRI 000	PRI 000	PRI 000	PRI 000	000	---
	SEC 030	SEC 016	SEC 010	SEC 009	065	8.5
QUESTION NOT ANSWERED	054	068	074	075		
MILITARY PREPAREDNESS	PRI 012	PRI 009	PRI 007	PRI 008	036	8.1
	SEC 043	SEC 036	SEC 042	SEC 034	155	20.3
QUESTION NOT ANSWERED	029	039	035	042		
MILITARY OPS (COMBAT)	PRI 000	PRI 007	PRI 001	PRI 001	009	2.0
	SEC 008	SEC 005	SEC 006	SEC 006	025	3.3
QUESTION NOT ANSWERED	076	072	077	077		
POLAR OPERATIONS-----	PRI 008	PRI 007	PRI 005	PRI 002	022	4.9
	SEC 005	SEC 001	SEC 001	SEC 001	008	1.0
QUESTION NOT ANSWERED	071	076	078	081		
SEARCH AND RESCUE----	PRI 030	PRI 026	PRI 032	PRI 028	116	26.0
	SEC 038	SEC 045	SEC 037	SEC 032	152	19.9
QUESTION NOT ANSWERED	016	013	015	024		
AIDS TO NAVIGATION---	PRI 009	PRI 026	PRI 022	PRI 012	069	15.5
	SEC 008	SEC 007	SEC 007	SEC 007	029	3.8
QUESTION NOT ANSWERED	067	051	055	065		
MARINE SCIENCE ACT.--	PRI 004	PRI 002	PRI 001	PRI 000	007	1.6
	SEC 030	SEC 031	SEC 023	SEC 015	099	13.0
QUESTION NOT ANSWERED	050	051	060	069		
OCEAN STATION--------	PRI 008	PRI 021	PRI 022	PRI 028	079	17.7
	SEC 005	SEC 000	SEC 003	SEC 000	008	1.0
QUESTION NOT ANSWERED	071	063	059	056		
TRAINING-------------	PRI 005	PRI 003	PRI 005	PRI 001	014	3.1
	SEC 022	SEC 021	SEC 016	SEC 016	075	9.8
QUESTION NOT ANSWERED	057	060	063	067		
OTHER----------------	PRI 001	PRI 003	PRI 004	PRI 003	011	2.5
	SEC 005	SEC 003	SEC 002	SEC 002	012	1.6
QUESTION NOT ANSWERED	078	078	078	079		

TABLE D2-9. MISSION ASSIGNMENTS OF RECENT TOURS - LT. COMMANDERS

NUMBER OF LT. COMMANDERS SURVEYED= 097

MISSION	TOUR 1	2	3	4	TOTAL	% OF TOTAL
ENFORCEMENT OF L&T---	PRI 030	PRI 007	PRI 006	PRI 007	050	9.8
	SEC 042	SEC 041	SEC 041	SEC 029	153	15.0
QUESTION NOT ANSWERED	025	049	050	061		
DOMESTIC ICEBREAKING-	PRI 005	PRI 003	PRI 001	PRI 003	012	2.3
	SEC 022	SEC 019	SEC 010	SEC 013	064	6.3
QUESTION NOT ANSWERED	070	075	086	081		
MARINE ENVIRON.PROT.	PRI 001	PRI 000	PRI 000	PRI 000	001	0.2
	SEC 029	SEC 021	SEC 016	SEC 018	084	8.2
QUESTION NOT ANSWERED	067	076	081	079		
MILITARY PREPAREDNESS	PRI 006	PRI 013	PRI 011	PRI 004	034	6.7
	SEC 051	SEC 041	SEC 043	SEC 033	168	16.5
QUESTION NOT ANSWERED	040	043	043	060		
MILITARY OPS (COMBAT)	PRI 001	PRI 027	PRI 017	PRI 006	051	10.0
	SEC 015	SEC 013	SEC 012	SEC 010	050	4.9
QUESTION NOT ANSWERED	081	057	068	081		
POLAR OPERATIONS-----	PRI 003	PRI 004	PRI 007	PRI 006	020	3.9
	SEC 008	SEC 008	SEC 006	SEC 008	030	2.9
QUESTION NOT ANSWERED	086	085	084	083		
SEARCH AND RESCUE----	PRI 031	PRI 029	PRI 038	PRI 029	127	24.9
	SEC 056	SEC 050	SEC 042	SEC 028	176	17.3
QUESTION NOT ANSWERED	010	018	017	040		
AIDS TO NAVIGATION---	PRI 044	PRI 036	PRI 019	PRI 010	109	21.3
	SEC 006	SEC 006	SEC 015	SEC 014	041	4.0
QUESTION NOT ANSWERED	047	055	063	073		
MARINE SCIENCE ACT.--	PRI 004	PRI 005	PRI 001	PRI 003	013	2.5
	SEC 030	SEC 035	SEC 028	SEC 022	115	11.3
QUESTION NOT ANSWERED	063	057	068	072		
OCEAN STATION--------	PRI 010	PRI 017	PRI 020	PRI 024	071	13.9
	SEC 009	SEC 012	SEC 009	SEC 007	037	3.6
QUESTION NOT ANSWERED	078	068	068	066		
TRAINING-------------	PRI 005	PRI 005	PRI 004	PRI 001	015	2.9
	SEC 026	SEC 025	SEC 024	SEC 021	096	9.4
QUESTION NOT ANSWERED	066	067	069	075		
OTHER----------------	PRI 005	PRI 002	PRI 001	PRI 000	008	1.6
	SEC 002	SEC 003	SEC 001	SEC 000	006	0.6
QUESTION NOT ANSWERED	090	092	095	097		

TABLE D2-10. MISSION ASSIGNMENTS OF RECENT TOURS - CWO's

NUMBER OF CWO'S SURVEYED= 012

MISSION		TOUR 1		2		3		4	TOTAL	% OF TOTAL
ENFORCEMENT OF L&T---	PRI	001	PRI	000	PRI	000	PRI	000	001	1.7
	SEC	006	SEC	006	SEC	007	SEC	003	022	28.9
QUESTION NOT ANSWERED		005		006		005		009		
DOMESTIC ICEBREAKING-	PRI	003	PRI	003	PRI	000	PRI	000	006	10.3
	SEC	001	SEC	002	SEC	002	SEC	001	006	7.9
QUESTION NOT ANSWERED		008		007		010		011		
MARINE ENVIRON.PROT.	PRI	001	PRI	000	PRI	000	PRI	000	001	1.7
	SEC	004	SEC	002	SEC	001	SEC	001	008	10.5
QUESTION NOT ANSWERED		007		010		011		011		
MILITARY PREPAREDNESS	PRI	000	PRI	000	PRI	001	PRI	001	002	3.4
	SEC	002	SEC	002	SEC	001	SEC	001	006	7.9
QUESTION NOT ANSWERED		010		010		010		010		
MILITARY OPS (COMBAT)	PRI	000	PRI	001	PRI	004	PRI	001	006	10.3
	SEC	001	SEC	001	SEC	000	SEC	000	002	2.6
QUESTION NOT ANSWERED		011		010		008		011		
POLAR OPERATIONS-----	PRI	000	PRI	000	PRI	000	PRI	000	000	---
	SEC	000	SEC	000	SEC	000	SEC	000	000	---
QUESTION NOT ANSWERED		012		012		012		012		
SEARCH AND RESCUE----	PRI	004	PRI	004	PRI	003	PRI	003	014	24.1
	SEC	006	SEC	006	SEC	006	SEC	004	022	28.9
QUESTION NOT ANSWERED		002		002		003		005		
AIDS TO NAVIGATION---	PRI	007	PRI	007	PRI	005	PRI	007	026	44.8
	SEC	000	SEC	000	SEC	001	SEC	000	001	1.3
QUESTION NOT ANSWERED		005		005		006		005		
MARINE SCIENCE ACT.--	PRI	000	PRI	000	PRI	000	PRI	000	000	---
	SEC	000	SEC	001	SEC	001	SEC	001	003	3.9
QUESTION NOT ANSWERED		012		011		011		011		
OCEAN STATION--------	PRI	000	PRI	000	PRI	001	PRI	001	002	3.4
	SEC	000	SEC	000	SEC	000	SEC	000	000	---
QUESTION NOT ANSWERED		012		012		011		011		
TRAINING-------------	PRI	000	PRI	000	PRI	000	PRI	000	000	---
	SEC	001	SEC	001	SEC	001	SEC	001	004	5.3
QUESTION NOT ANSWERED		011		011		011		011		
OTHER----------------	PRI	000	PRI	000	PRI	000	PRI	000	000	---
	SEC	002	SEC	000	SEC	000	SEC	000	002	2.6
QUESTION NOT ANSWERED		010		012		012		012		

APPENDIX D - PART 2

SECTION II - OPERATIONAL PERFORMANCE AND TRAINING ASSESSMENT

SECTION II - OPERATIONAL PERFORMANCE AND TRAINING ASSESSMENT

Question 1 - Most Effective Training Methods.

This question directed that the officer, based on his experience, indicate the most effective training method for each of the various operational functions listed.

Table D2-11 shows the choices of best training method for each operational function for the entire group surveyed. The following tables show the choices by rank of respondent.

TABLE D2-11. SELECTED TRAINING METHOD FOR EACH OPERATIONAL FUNCTION - ALL RANKS

NUMBER OF OFFICERS SURVEYED= 235

	OPERATIONAL FUNCTIONS											
TRAINING METHOD	NO EXP	ASW OPS	CIC OPS	SAR OPS	AIR HEL	COM	NAV OPS	SHP HDL	GUN NRY	SMN SHP	DMG CTL	ENG
TRAINING TEAMS AND STD'S	014	010	074	113	049	033	043	009	010	018	026	024
MOBILE TECHNICAL UNITS (MOTU)	168	001	000	000	006	005	001	000	002	000	000	006
TRAINING AVAIL-ABILITY	075	007	009	009	017	024	013	027	016	016	046	014
SIMULATORS	056	092	079	021	004	014	020	053	007	002	024	007
REFTRA	018	056	044	002	013	072	110	066	149	105	144	145
MULTI-UNIT/JOINT SERVICE EXER.	039	013	023	052	068	036	018	035	004	054	002	001
FLEET(OTHER THAN EXERCISES)	134	002	007	004	007	007	007	015	005	010	002	002
FLEET EXERCISES	133	031	009	001	001	012	003	003	004	001	000	000

TABLE D2-12. SELECTED TRAINING METHOD FOR EACH OPERATIONAL FUNCTION - CAPTS.

NUMBER OF CAPTAINS SURVEYED= 042

	OPERATIONAL FUNCTIONS											
TRAINING METHOD	NO EXP	ASW OPS	CIC OPS	SAR OPS	AIR HEL	COM	NAV OPS	SHP HDL	GUN NRY	SMN SHP	DMG CTL	ENG
TRAINING TEAMS AND STD'S	001	001	014	021	016	006	005	002	000	001	002	002
MOBILE TECHNICAL UNITS (MOTU)	022	000	000	000	001	001	000	000	001	000	000	002
TRAINING AVAIL-ABILITY	012	001	000	001	005	000	003	008	004	004	006	003
SIMULATORS	004	020	014	006	001	003	003	004	000	000	003	001
REFTRA	001	016	012	000	002	017	024	018	029	026	032	029
MULTI-UNIT/JOINT SERVICE EXER.	003	002	008	008	011	006	004	010	001	006	000	000
FLEET(OTHER THAN EXERCISES	019	000	000	001	001	002	002	000	001	001	000	000
FLEET EXERCISES	015	005	001	000	000	005	002	001	003	001	000	000

TABLE D2-13. SELECTED TRAINING METHOD FOR EACH OPERATIONAL FUNCTION - COMMANDERS

NUMBER OF COMMANDERS SURVEYED= 084

	OPERATIONAL FUNCTIONS											
TRAINING METHOD	NO EXP	ASW OPS	CIC OPS	SAR OPS	AIR HEL	COM	NAV OPS	SHP HDL	GUN NRY	SMN SHP	DMG CTL	ENG
TRAINING TEAMS AND STD'S	003	001	029	042	022	006	016	002	001	004	007	009
MOBILE TECHNICAL UNITS (MOTU)	056	000	000	000	001	000	001	000	001	000	000	002
TRAINING AVAIL-ABILITY	023	002	003	004	006	014	009	008	004	007	017	009
SIMULATORS	009	040	032	009	003	003	006	031	004	002	011	003
REFTRA	006	019	015	000	005	031	041	020	066	038	057	053
MULTI-UNIT/JOINT SERVICE EXER.	012	006	006	021	026	017	009	012	001	023	000	000
FLEET(OTHER THAN EXERCISES	041	000	004	001	003	003	002	006	000	003	000	001
FLEET EXERCISES	043	015	002	000	001	005	001	002	000	000	000	000

TABLE D2-14. SELECTED TRAINING METHODS FOR EACH OPERATIONAL FUNCTION - LT. CMDRS.

NUMBER OF LT. COMMANDERS SURVEYED= 097

	OPERATIONAL FUNCTIONS											
TRAINING METHOD	NO EXP	ASW OPS	CIC OPS	SAR OPS	AIR HEL	COM	NAV OPS	SHP HDL	GUN NRY	SMN SHP	DMG CTL	ENG
TRAINING TEAMS AND STD'S	007	008	027	046	011	019	022	005	009	012	014	012
MOBILE TECHNICAL UNITS (MOTU)	079	000	000	000	004	004	000	000	000	000	000	002
TRAINING AVAIL-ABILITY	035	003	005	003	006	010	001	010	008	004	021	002
SIMULATORS	037	031	032	005	000	008	011	018	003	000	008	003
REFTRA	007	020	016	002	006	023	042	026	051	039	052	061
MULTI-UNIT/JOINT SERVICE EXER.	020	004	008	021	030	012	004	011	001	021	001	000
FLEET(OTHER THAN EXERCISES	066	001	002	002	003	002	003	009	004	006	001	001
FLEET EXERCISES	066	009	004	001	000	002	000	000	001	000	000	000

TABLE D2-15. SELECTED TRAINING METHOD FOR EACH OPERATIONAL FUNCTION - CWO's

NUMBR OF CWO'S SURVEYED= 012

TRAINING METHOD	OPERATIONAL FUNCTIONS											
	NO EXP	ASW OPS	CIC OPS	SAR OPS	AIR HEL	COM	NAV OPS	SHP HDL	GUN NRY	SMN SHP	DMG CTL	ENG
TRAINING TEAMS AND STD'S	003	000	004	004	000	002	000	000	000	001	003	001
MOBILE TECHNICAL UNITS (MOTU)	011	001	000	000	000	000	000	000	000	000	000	000
TRAINING AVAIL-ABILITY	005	001	001	001	000	000	000	001	000	001	002	000
SIMULATORS	006	001	001	001	000	000	000	000	000	000	002	000
REFTRA	004	001	001	000	000	001	003	002	003	002	003	002
MULTI-UNIT/JOINT SERVICE EXER.	004	001	001	002	001	001	001	002	001	004	001	001
FLEET(OTHER THAN EXERCISES	008	001	001	000	000	000	000	000	000	000	001	000
FLEET EXERCISES	009	002	002	000	000	000	000	000	000	000	000	000

Question 2 - Operational Effectiveness of Specific Simulators.

This question required a qualitative indication of the effectiveness of team trainer-simulators identified as ASW Types 14A2 and 14A6 and CIC trainers STD Mobile Unit and Triple Threat Systems.

Table D2-16 shows the valuation of the entire survey group. It should be noted that a large proportion of respondents had no experience with either of the ASW simulators nor with the Multi-Unit Triple Threat CIC simulator. Most were familiar with the STD Mobile Unit. Of those with experience with these units, most rated above normal in effectiveness. The same held true when the group was broken down by rank except in the case of CWO's where the number who had had any experience with the devices was very small.

TABLE D2-16. EFFECTIVENESS OF TRAINING SIMULATORS - ALL RANKS

	ASW		CIC	
	14A2	14A6	STD(MOBILE UNIT)	MULTI-UNIT TRI THREAT
1. LOW	000	000	004	000
2. BELOW NORMAL	002	002	017	003
3. NORMAL	012	010	059	008
4. ABOVE NORMAL	016	007	068	012
5. HIGH	034	020	044	031
6. UNKNOWN-NO OPINION	154	168	036	161

TABLE D2-17. EFFECTIVENESS OF TRAINING SIMULATORS - CAPTAINS

NUMBER OF CAPTAINS SURVEYED= 042

	ASW 14A2	ASW 14A6	CIC STD(MOBILE UNIT)	CIC MULTI-UNIT TRI THREAT
1. LOW	000	000	000	000
2. BELOW NORMAL	000	000	008	000
3. NORMAL	003	005	013	002
4. ABOVE NORMAL	004	002	007	002
5. HIGH	018	008	010	011
6. UNKNOWN-NO OPINION	016	024	004	024

TABLE D2-18. EFFECTIVENESS OF TRAINING SIMULATORS - COMMANDERS

NUMBER OF COMMANDERS SURVEYED= 084

	ASW 14A2	ASW 14A6	CIC STD(MOBILE UNIT)	CIC MULTI-UNIT TRI THREAT
1. LOW	000	000	003	000
2. BELOW NORMAL	001	001	007	002
3. NORMAL	004	004	025	003
4. ABOVE NORMAL	008	003	023	005
5. HIGH	009	007	019	014
6. UNKNOWN-NO OPINION	056	061	007	053

TABLE D2-19. EFFECTIVENESS OF TRAINING SIMULATORS - LT. COMMANDERS

NUMBER OF LT. COMMANDERS SURVEYED= 097

	ASW		CIC	
	14A2	14A6	STD(MOBILE UNIT)	MULTI-UNIT TRI THREAT
1. LOW	000	000	000	000
2. BELOW NORMAL	000	000	002	001
3. NORMAL	004	000	020	003
4. ABOVE NORMAL	004	002	037	005
5. HIGH	006	004	013	005
6. UNKNOWN-NO OPINION	075	075	019	074

TABLE D2-20. EFFECTIVENESS OF TRAINING SIMULATORS - CWO's

NUMBER OF CWO'S SURVEYED = 012

	ASW		CIC	
	14A2	14A6	STD(MOBILE UNIT)	MULTI-UNIT TRI THREAT
1. LOW	000	000	001	000
2. BELOW NORMAL	001	001	000	000
3. NORMAL	001	001	001	000
4. ABOVE NORMAL	000	000	001	000
5. HIGH	001	001	002	001
6. UNKNOWN-NO OPINION	007	008	006	010

Question 3 - Effectiveness of Present Operational Training

This question required respondents to rate on a scale of 1 (unacceptable) to 5 (fully acceptable) the effectiveness of present training programs in preparing vessels' crews to perform all aspects of each mission's tasks as well as the mission-unique tasks for eleven different missions. (A rating of 3.0 is defined as "minimally acceptable.")

Table D2-21 shows the mean ratings assigned by the officers surveyed.

TABLE D2-21. EFFECTIVENESS OF PRESENT OPERATIONAL TRAINING - SUMMARY

MISSION	TRAINING EFFECTIVENESS All Aspects	Mission-Unique Aspects
Enforcement of Laws & Treaties	2.9	2.4
Domestic Icebreaking	2.8	2.5
Marine Environ. Protection	2.5	2.4
Military Preparedness	3.3	3.2
Military Operations	3.0	2.9
Polar Operations	2.8	2.6
SAR	3.6	3.6
Adis to Navigation	3.4	3.4
Marine Science Activities	3.0	2.8
Ocean Station	3.3	3.1

It will be seen that relatively high ratings are given to operational training for SAR, Aids to Navigation, Military Preparedness and Ocean Station which receive fully acceptable ratings and that low ratings are given to training for Marine Environmental Protection and the mission-unique aspects of ELT and Domestic Icebreaking which are rated less than minimally acceptable.

Table D2-22 shows the number of officers and their percent assigning each of the five ratings levels to training effectivenss for each of the missions.

TABLE D2-22. EFFECTIVENESS OF PRESENT OPERATIONAL TRAINING

NUMBER OF OFFICERS SURVEYED= 235

MISSION	COMPATIBILITY SCALE FACTOR: ALL ASPECTS		COMPATIBILITY SCALE FACTOR: MISSION-UNIQUE ASPECTS	
A. ENFORCEMENT OF L&T	1= 029	13.1%	1= 060	27.2%
	2= 040	18.1%	2= 059	26.8%
	3= 090	40.7%	3= 068	30.9%
	4= 055	24.9%	4= 028	12.7%
	5= 008	3.6%	5= 006	2.7%
	NO ANS= 013		NO ANS= 014	
	ANS= 221		ANS= 220	
B. DOMESTIC ICEBREAKING	1= 045	25.6%	1= 063	36.0%
	2= 020	11.3%	2= 027	15.4%
	3= 056	31.8%	3= 043	24.6%
	4= 040	22.7%	4= 027	15.4%
	5= 016	9.1%	5= 016	9.1%
	NO ANS= 058		NO ANS= 059	
	ANS= 176		ANS= 175	
C. MARINE ENVIRON. PROT.	1= 035	17.6%	1= 054	27.7%
	2= 040	20.1%	2= 047	24.1%
	3= 076	38.2%	3= 067	34.4%
	4= 038	19.1%	4= 020	10.3%
	5= 011	5.5%	5= 008	4.1%
	NO ANS= 035		NO ANS= 039	
	ANS= 199		ANS 195	
D. MILITARY PREPAREDNESS	1= 009	4.1%	1= 014	6.3%
	2= 034	15.2%	2= 034	15.2%
	3= 071	31.7%	3= 085	37.9%
	4= 094	42.0%	4= 074	33.0%
	5= 017	7.6%	5= 018	8.0%
	NO ANS= 010		NO ANS= 010	
	ANS= 224		ANS= 224	
E. MILITARY OPS (COMBAT)	1= 021	10.2%	1= 027	13.2%
	2= 040	19.4%	2= 042	20.5%
	3= 073	35.4%	3= 078	38.0%
	4= 060	29.1%	4= 045	22.0%
	5= 013	6.3%	5= 014	6.8%
	NO ANS= 028		NO ANS= 029	
	ANS= 206		ANS= 205	
F. POLAR OPERATIONS	1= 036	22.2%	1= 049	30.8%
	2= 020	12.3%	2= 026	16.4%
	3= 062	38.3%	3= 045	28.3%
	4= 037	22.8%	4= 028	17.6%
	5= 008	4.9%	5= 012	7.5%
	NO ANS= 072		NO ANS= 075	
	ANS= 162		ANS= 159	

TABLE D2-22. EFFECTIVENESS OF PRESENT OPERATIONAL TRAINING - (Continued)

G. SEARCH AND RESCUE	1= 006	2.6%	1= 014	6.1%
	2= 027	11.8%	2= 024	10.5%
	3= 059	25.8%	3= 051	22.4%
	4= 093	40.6%	4= 093	40.8%
	5= 045	19.7%	5= 047	20.6%
	NO ANS= 005		NO ANS= 006	
	ANS= 229		ANS= 228	
H. AIDS TO NAVIGATION	1= 016	8.2%	1= 025	13.1%
	2= 027	13.8%	2= 022	11.5%
	3= 052	26.7%	3= 035	18.3%
	4= 071	36.4%	4= 074	38.7%
	5= 030	15.4%	5= 036	18.8%
	NO ANS= 039		NO ANS= 043	
	ANS= 195		ANS= 191	
I. MARINE SCIENCE ACT.	1= 020	10.5%	1= 031	16.4%
	2= 030	15.7%	2= 033	17.5%
	3= 077	40.3%	3= 081	42.9%
	4= 052	27.2%	4= 033	17.5%
	5= 013	6.8%	5= 012	6.3%
	NO ANS= 043		NO ANS= 045	
	ANS= 191		ANS= 189	
J. OCEAN STATION	1= 022	13.0%	1= 033	19.6%
	2= 018	10.7%	2= 019	11.3%
	3= 053	31.2%	3= 045	26.8%
	4= 048	28.4%	4= 042	25.0%
	5= 029	17.2%	5= 030	17.9%
	NO ANS= 065		NO ANS= 066	
	ANS= 169		ANS= 168	

Question 4 - Effectiveness of CG-415 Unit Training Afloat.

It was judged by the officer group queried that Unit Training Afloat is 46.2% effective in maintaining the proficiency achieved by the training methods listed in Question 1 of this Section. A breakdown of the 214 answers received is shown in Table D2-23.

TABLE D2-23. EFFECTIVENESS OF CG-415

NUMBER OF OFFICERS SURVEYED= 235

PERCENT EFFECTIVE	QUANTITY
01	001
10	011
15	004
20	016
25	016
30	021
33	001
35	004
40	020
44	001
50	052
60	018
65	004
70	014
75	017
80	010
85	002
90	002

AVERAGE PERCENT EFFECTIVE= 46.18 BASED ON 214 ANSWERS.

Question 5 - Can REFTRA Proficiency be Maintained by Unit OJT?

Two-hundred-three officers (89%) of the 228 answering the question replied in the affirmative. The average number of months for which REFTRA training remains effective was judged to be 9.4.

TABLE D2-24. EFFECTIVENESS OF OJT

NUMBER OF OFFICERS SURVEYED= 235

THERE WERE 025 NO ANSWERS.

THERE WERE 007 NOT ANSWERING QUESTION.

THERE WERE 203 YES ANSWERS.

MONTHS	QUANTITY
03	019
06	092
12	071
18	013
24	007
36	001

AVERAGE MONTHS PROFICIENCY= 09.35

Question 6 - Variation in Effectiveness of OJT Training.

Of the officers queried, 94.9% felt that effectiveness varied with the department considered and 88.9% felt that variations also exist within specific departments.

Table D2-25 shows which operational areas are felt to be most affected by variations in OJT effectiveness. All areas were judged affected equally by 42.5% of the officers.

TABLE D2-25. VARIATIONS IN OJT EFFECTIVENESS

NUMBER OF OFFICERS SURVEYED= 235

	DEPARTMENT	WITHIN DEPARTMENT
YES	223 = 94.89 %	209 = 88.93 %
NO	012	026
NO ANS	000	000

OPERATIONAL AREAS MOST AFFECTED.

ASW OPS	019	00.00%
CIC OPS	011	04.97%
SAR OPS	005	02.26%
AIR/HELO	004	01.80%
COMMUNICATIONS	005	02.26%
BRIDGE/NAV OPS	014	06.33%
SHIPHANDLING	002	00.90%
GUNNERY	002	00.90%
DECK SEAMANSHIP	011	04.97%
DAMAGE CONTROL	050	22.62%
ENGINEERING	004	01.80%
ALL EQUALLY AFF.	094	42.53%
TOTAL	221	

Question 7 - Estimate of Average Grade Achieved at REFTRA.

The officer group estimated that the average Coast Guard unit received a grade of 82% at REFTRA training exercises. Table D2-26 shows the number of officers estimating each grade.

TABLE D2-26. ESTIMATED REFTRA GRADES

NUMBER OF OFFICERS SURVEYED= 235

PERCENT	QUANTITY
60	001
65	001
68	001
70	007
72	001
75	018
76	001
77	001
78	006
79	004
80	049
81	005
82	017
83	006
84	009
85	059
86	004
87	011
88	014
89	002
90	008
92	001
93	003

AVERAGE OF AVERAGE GRADES (IN %) ACHIEVED IN REFTRA = 82.23%.

OFFICERS NOT ANSWERING QUESTION= 006

Question 8 - Optiminal Grade to be Achieved at REFTRA.

Fifty-eight percent (58%) of those queried felt that their answer to Question 7 (Average Grade of 82%) was optimum; that is, it assured reasonable proficiency while minimizing non-operational training time. Forty-two percent (42%) suggested an optiminal average grade of 87%.

Table D2-27 shows the optimum grade to be achieved in REFTRA and the number of officers selecting that grade.

TABLE D2-27 OPTIMUM REFTRA GRADE

NUMBER OF OFFICERS SURVEYED= 235

NUMBER OF YES ANSWERS= 137

NUMBER OF OFFICERS GIVING NEW PERCENTAGE= 098

PERCENT	QUANTITY
70	003
75	003
78	001
80	006
82	002
83	001
84	003
85	015
86	003
88	006
90	026
91	001
92	003
94	001
95	008
97	001

AVERAGE OF AVERAGE OF OPTIMAL GRADE SPECIFIED BY OFFICERS= 86.87

Question 9 - Which Training Method Should Be Expanded?

Respondents were asked to select a first and second choice from among the eight training methods of Question 1, which they felt should be expanded. Of all officers answering this question, about 27% chose Training Teams and STD's and 26% chose Simulators as their preference followed by REFTRA (21%) and Training Availability (18%). None chose fleet activities as a training mode to be expanded. As second choices, Training Teams (28%), Training Availability (19%), Simulators (16%), and Joint Exercises (15%) led the ratings.

Table D2-28 shows the full statistics relative to this question.

TABLE D2-28. TRAINING METHODS WHICH SHOULD BE EXPANDED

NUMBER OF OFFICERS SURVYED = 235

	TRAINING METHOD	FIRST CHOICE #	FIRST CHOICE %	SECOND CHOICE #	SECOND CHOICE %
1	STD's & Training Teams	061	26.8%	064	28.3%
2	Mobile Technical Units	002	0.9%	008	3.1%
3	Training Availability	041	18.0%	043	19.0%
4	Simulators	060	26.3%	037	16.4%
5	REFTRA	048	21.1%	028	12.4%
6	Joint Service Exercises	016	7.0%	033	14.6%
7	Fleet (Other than exer.)	000	----	006	2.7%
8	Fleet ASW	000	----	007	3.1%
	NUMBER OF ANSWERS	228		226	

Question 10 - Operational Functions Causing Most Difficulty.

Officers were asked to rank from 1 (most severe) to 5 (least severe) those five of eleven operational functions that continually cause difficulty in evaluation exercises. Most frequently ranked, both as most severe and in terms of total mentions, was Damage Control. Least often mentioned was Air/Helo Flight Deck Operations. Table D2-29 is a tally of all responses from 235 officers.

Tables D2-30 through D2-33 break this information down further by respondent's rank. Similar results are seen.

TABLE D2-29. OPERATIONAL FUNCTIONS CAUSING MOST DIFFICULTY - ALL RANKS

NUMBER OF OFFICERS SURVEYED=235

OPERATIONAL FUNCTIONS	RANK ORDER					
	1	2	3	4	5	ZERO
1. ASW OPS	033	028	024	016	016	118
2. CIC OPS	016	036	038	031	021	093
3. SAR OPS	008	006	013	014	015	179
4. AIR/HELO FLIGHT DECK	003	005	007	002	011	207
5. COMMUNICATIONS	031	025	025	027	023	104
6. BRIDGE/NAV OPS	010	030	028	034	031	102
7. SHIPHANDLING	007	007	007	009	024	181
8. GUNNERY	022	041	029	030	018	095
9. DECK SEAMANSHIP	002	005	019	015	032	162
10. DAMAGE CONTROL	091	028	021	021	016	058
11. ENGINEERING	004	016	016	027	017	155

TABLE D2-30. OPERATIONAL FUNCTIONS CAUSING MOST DIFFICULTY - CAPTAINS

NUMBER OF CAPTAINS SURVEYED=042

OPERATIONAL FUNCTIONS	RANK ORDER 1	2	3	4	5	ZERO
1. ASW OPS	010	006	003	003	006	014
2. CIC OPS	004	007	008	007	003	013
3. SAR OPS	001	001	002	002	002	034
4. AIR/HELO FLIGHT DECK	000	001	001	000	003	037
5. COMMUNICATIONS	004	004	005	006	001	022
6. BRIDGE/NAV OPS	001	005	003	007	010	016
7. SHIPHANDLING	002	001	001	001	003	034
8. GUNNERY	005	006	010	004	004	013
9. DECK SEAMANSHIP	000	002	005	002	004	029
10. DAMAGE CONTROL	014	003	005	006	004	010
11. ENGINEERING	001	006	000	003	002	030

TABLE D-2-31. OPERATIONAL FUNCTIONS CAUSING MOST DIFFICULTY - COMMANDERS

NUMBER OF COMMANDERS SURVEYED=084

OPERATIONAL FUNCTIONS	RANK ORDER					
	1	2	3	4	5	ZERO
1. ASW OPS	008	011	011	007	007	040
2. CIC OPS	005	013	015	009	010	032
3. SAR OPS	001	002	004	005	006	066
4. AIR/HELO FLIGHT DECK	000	002	001	001	003	077
5. COMMUNICATIONS	012	013	010	008	011	030
6. BRIDGE/NAV OPS	002	009	010	009	013	041
7. SHIPHANDLING	002	001	003	003	006	069
8. GUNNERY	009	018	009	012	005	031
9. DECK SEAMANSHIP	000	001	004	006	008	065
10. DAMAGE CONTROL	038	006	006	008	004	022
11. ENGINEERING	002	002	005	011	004	060

TABLE D2-32. OPERATIONAL FUNCTIONS CAUSING MOST DIFFICULTY - LT. COMMANDERS

NUMBER OF LT. COMMANDERS SURVEYED=097

OPERATIONAL FUNCTIONS	RANK ORDER					
	1	2	3	4	5	ZERO
1. ASW OPS	012	011	009	006	002	057
2. CIC OPS	006	014	014	013	008	042
3. SAR OPS	004	003	004	007	006	073
4. AIR/HELO FLIGHT DECK	003	000	005	001	004	084
5. COMMUNICATIONS	014	007	009	012	011	044
6. BRIDGE/NAV OPS	006	015	013	016	008	039
7. SHIPHANDLING	003	004	003	005	013	069
8. GUNNERY	007	016	010	014	007	043
9. DECK SEAMANSHIP	002	001	009	007	018	060
10. DAMAGE CONTROL	037	018	008	006	007	021
11. ENGINEERING	001	007	011	008	010	060

TABLE D2-33. OPERATIONAL FUNCTIONS CAUSING MOST DIFFICULTY - CWO's

NUMBER OF CWO'S SURVEYED=012

OPERATIONAL FUNCTIONS	RANK ORDER 1	2	3	4	5	ZERO
1. ASW OPS	003	000	001	000	001	007
2. CIC OPS	001	002	001	002	000	006
3. SAR OPS	002	000	003	000	001	006
4. AIR/HELO FLIGHT DECK	000	002	000	000	001	009
5. COMMUNICATIONS	001	001	001	001	000	008
6. BRIDGE/NAV OPS	001	001	002	002	000	006
7. SHIPHANDLING	000	001	000	000	002	009
8. GUNNERY	001	001	000	000	002	008
9. DECK SEAMANSHIP	000	001	001	000	002	008
10. DAMAGE CONTROL	002	001	002	001	001	005
11. ENGINEERING	000	001	000	005	001	005

Question 11 - Affect of Training Limitations on Proficiency.

Eighty-six percent (86%) of those responding feel that limitations in training time or training assignments adversely affect proficiency. Of these, most feel that the adverse affect is large. Table D2-34 shows the response of the entire group and Tables D2-35 through D2-38 show breakdowns by respondent's rank. The results for each rank are similar.

TABLE D2-34. AFFECT OF TRAINING LIMITATIONS ON PROFICIENCY - ALL RANKS

NUMBER OF OFFICERS SURVEYED=235

DO TRAINING TIME OR TRAINING ASSIGNMENT LIMITATIONS ADVERSELY AFFECT PROFICIENCY?

OFFICERS ANSWERING YES = 202

OFFICERS ANSWERING NO = 032

OFFICERS NOT ANSWERING QUESTION = 001

THE FOLLOWING IS A BREAKDOWN OF DEGREE:

VERY LITTLE	003
LITTLE	008
NOMINAL	051
MUCH	095
VERY MUCH	043

TABLE D2-35. AFFECT OF TRAINING LIMITATIONS ON PROFICIENCY - CAPTAINS

NUMBER OF CAPTAINS SURVEYED=042

DO TRAINING TIME OR TRAINING ASSIGNMENT LIMITATIONS
ADVERSELY AFFECT PROFICIENCY?

OFFICERS ANSWERING YES = 036

OFFICERS ANSWERING NO = 006

OFFICERS NOT ANSWERING QUESTION = 000

THE FOLLOWING IS A BREAKDOWN OF DEGREE:

VERY LITTLE	000
LITTLE	002
NOMINAL	008
MUCH	015
VERY MUCH	010

TABLE D2-36. AFFECT OF TRAINING LIMITATIONS ON PROFICIENCY - COMMANDERS

NUMBER OF COMMANDERS SURVEYED=084

DO TRAINING TIME OR TRAINING ASSIGNMENT LIMITATIONS
ADVERSELY AFFECT PROFICIENCY?

OFFICERS ANSWERING YES = 076

OFFICERS ANSWERING NO = 007

OFFICERS NOT ANSWERING QUESTION = 001

THE FOLLOWING IS A BREAKDOWN OF DEGREE:

VERY LITTLE	002
LITTLE	004
NOMINAL	021
MUCH	033
VERY MUCH	015

TABLE D2-37. AFFECT OF TRAINING LIMITATIONS ON PROFICIENCY - LT. COMMANDERS

NUMBER OF LT. COMMANDERS SURVEYED=097

DO TRAINING TIME OR TRAINING ASSIGNMENT LIMITATIONS
ADVERSELY AFFECT PROFICIENCY?

OFFICERS ANSWERING YES = 082

OFFICERS ANSWERING NO = 015

OFFICERS NOT ANSWERING QUESTION = 000

THE FOLLOWING IS A BREAKDOWN OF DEGREE:

VERY LITTLE	001
LITTLE	002
NOMINAL	022
MUCH	041
VERY MUCH	016

TABLE D2-38. AFFECT OF TRAINING LIMITATIONS ON PROFICIENCY - CWO's

NUMBER OF CWO'S SURVEYED=012

DO TRAINING TIME OR TRAINING ASSIGNMENT LIMITATIONS
ADVERSELY AFFECT PROFICIENCY?

OFFICERS ANSWERING YES = 008

OFFICERS ANSWERING NO = 004

OFFICERS NOT ANSWERING QUESTION = 000

THE FOLLOWING IS A BREAKDOWN OF DEGREE:

VERY LITTLE	000
LITTLE	000
NOMINAL	000
MUCH	006
VERY MUCH	002

Question 12 - Optimum Length of Tours Afloat.

The average officer believes that an optimum length for sea-going tours is about 29 months with the median selecting 24 months. Table D2-39 shows the breakdown. The breakdowns by rank are similar (Tables D2-40 through D2-43).

TABLE D2-39. OPTIMUM LENGTH OF TOURS AFLOAT - ALL RANKS

NUMBER OF OFFICERS SURVEYED=235

THE FOLLOWING IS A BREAKDOWN OF MONTHS PER TOUR.

MONTHS	QUANTITY
18	004
20	001
21	001
24	117
25	001
27	001
30	033
36	069
40	001
48	002
60	001

SUMMARY

NUMBER OF OFFICERS NOT ANSWERING QUESTION=004

NUMBER OF OFFICERS ANSWERING = 231

AVERAGE OF AVERAGE TOUR LENGTH = 28.75 MONTHS.

TABLE D2-40. OPTIMUM LENGTH OF TOURS AFLOAT - CAPTAINS

NUMBER OF CAPTAINS SURVEYED=042

THE FOLLOWING IS A BREAKDOWN OF MONTHS PER TOUR.

MONTHS	QUANTITY
18	001
24	017
30	006
36	016
60	001

SUMMARY

NUMBER OF OFFICERS NOT ANSWERING QUESTION=001

NUMBER OF OFFICERS ANSWERING = 041

AVERAGE OF AVERAGE TOUR LENGTH = 30.29 MONTHS.

TABLE D2-41. OPTIMUM LENGTH OF TOURS AFLOAT - COMMANDERS

NUMBER OF COMMANDERS SURVEYED=084

THE FOLLOWING IS A BREAKDOWN OF MONTHS PER TOUR.

MONTHS	QUANTITY
18	002
21	001
24	047
25	001
27	001
30	010
36	017
40	001
48	001

SUMMARY

NUMBER OF OFFICERS NOT ANSWERING QUESTION=003

NUMBER OF OFFICERS ANSWERING = 081

AVERAGE OF AVERAGE TOUR LENGTH = 27.61 MONTHS.

TABLE D2-42. OPTIMUM LENGTH OF TOURS AFLOAT - LT. COMMANDERS

NUMBER OF LT. COMMANDERS SURVEYED=097

THE FOLLOWING IS A BREAKDOWN OF MONTHS PER TOUR.

MONTHS	QUANTITY
18	001
20	001
24	048
30	017
36	029
48	001

SUMMARY

NUMBER OF OFFICERS NOT ANSWERING QUESTION=000

NUMBER OF OFFICERS ANSWERING = 097

AVERAGE OF AVERAGE TOUR LENGTH = 28.78 MONTHS.

TABLE D2-43. OPTIMUM LENGTH OF TOURS AFLOAT - CWO's

NUMBER OF CWO'S SURVEYED=012

THE FOLLOWING IS A BREAKDOWN OF MONTHS PER TOUR.

MONTHS	QUANTITY
24	005
36	007

SUMMARY

NUMBER OF OFFICERS NOT ANSWERING QUESTION=000

NUMBER OF OFFICERS ANSWERING = 012

AVERAGE OF AVERAGE TOUR LENGTH = 31.00 MONTHS.

Question 13 - Affect of Personnel Assignment Policies on Team Performance.

A high proportion of all officers as a group and each rank as a group agree that personnel transfer and assignment policies have a great affect on team proficiency. This is shown in Tables D2-44 through D2-48.

TABLE D2-44. AFFECT OF PERSONNEL ASSIGNMENT POLICIES ON TEAM PERFORMANCE - ALL RANKS

NUMBER OF OFFICERS SURVEYED=235

HOW MUCH DO PERSONNEL TRANSFER AND ASSIGNMENT POLICIES AFFECT TEAM PERFORMANCE AND SKILL DEVELOPMENT?

		% OF RESPONSES
VERY LITTLE	001	0.4%
LITTLE	003	2.1%
NOMINAL	016	6.8%
MUCH	079	33.6%
VERY MUCH	136	57.9%

NUMBER OF OFFICERS NOT ANSWERING QUESTION=000

TABLE D2-45. AFFECT OF PERSONNEL ASSIGNMENT POLICIES ON TEAM PERFORMANCE - CAPTAINS

NUMBER OF CAPTAINS SURVEYED=042

HOW MUCH DO PERSONNEL TRANSFER AND ASSIGNMENT POLICIES AFFECT TEAM PERFORMANCE AND SKILL DEVELOPMENT?

		% OF RESPONSES
VERY LITTLE	000	----
LITTLE	000	----
NOMINAL	002	4.8%
MUCH	009	21.4%
VERY MUCH	031	73.8%

NUMBER OF OFFICERS NOT ANSWERING QUESTION=000

TABLE D2-46. AFFECT OF PERSONNEL ASSIGNMENT POLICIES ON TEAM PERFORMANCE - COMMANDERS

NUMBER OF COMMANDERS SURVEYED=084

HOW MUCH DO PERSONNEL TRANSFER AND ASSIGNMENT POLICIES AFFECT TEAM PERFORMANCE AND SKILL DEVELOPMENT?

		% OF RESPONSES
VERY LITTLE	001	1.2%
LITTLE	001	1.2%
NOMINAL	008	9.5%
MUCH	028	33.3%
VERY MUCH	046	54.8%

NUMBER OF OFFICERS NOT ANSWERING QUESTION=000

TABLE D2-47. AFFECT OF PERSONNEL ASSIGNMENT POLICIES ON TEAM PERFORMANCE - LT. COMMANDERS

NUMBER OF LT. COMMANDERS SURVEYED=097

HOW MUCH DO PERSONNEL TRANSFER AND ASSIGNMENT POLICIES AFFECT TEAM PERFORMANCE AND SKILL DEVELOPMENT?

		% OF RESPONSES
VERY LITTLE	000	----
LITTLE	002	2.1%
NOMINAL	003	3.1%
MUCH	039	40.2%
VERY MUCH	053	54.6%

NUMBER OF OFFICERS NOT ANSWERING QUESTION=000

TABLE D2-48. AFFECT OF PERSONNEL ASSIGNMENT POLICIES ON TEAM PERFORMANCE - CWO's

NUMBER OF CWO'S SURVEYED=012

HOW MUCH DO PERSONNEL TRANSFER AND ASSIGNMENT POLICIES AFFECT TEAM PERFORMANCE AND SKILL DEVELOPMENT?

		% OF RESPONSES
VERY LITTLE	000	----
LITTLE	000	----
NOMINAL	003	25.0%
MUCH	003	25.0%
VERY MUCH	006	50.0%

NUMBER OF OFFICERS NOT ANSWERING QUESTION=000

Question 14 - Percentage of Assigned Personnel in Learning Cycle.

It is the judgment of the survey group that about 38% of their Operations Department, 38% of their Engineering Department and 49% of their Deck/Weapons Departments are in the training cycle at any one time and not able to perform reliably all the functions of their assignments. This is shown in Tables D2-49, D2-50 and D2-51.

TABLE D2-49. PERCENTAGE OF ASSIGNED PERSONNEL IN LEARNING CYCLE - OPERATIONS

NUMBER OF OFFICERS SURVEYED = 235

DEPARTMENT

OPERATIONS	PERCENT	QUANTITY	COL.1 X COL.2
	01	001	= 0001
	05	003	= 0015
	06	001	= 0006
	10	019	= 0190
	15	010	= 0150
	20	021	= 0420
	25	034	= 0850
	30	032	= 0960
	33	007	= 0231
	35	001	= 0035
	40	024	= 0960
	50	036	= 1800
	60	009	= 0540
	65	003	= 0195
	66	001	= 0066
	70	007	= 0490
	75	007	= 0525
	80	006	= 0480
	90	007	= 0630
	99	001	= 0099
		---	----
		230	= 8643

AVERAGE NUMBER OF PERSONNEL IN TRAINING CYCLE = 37.57%
NUMBER OF OFFICERS NOT ANSWERING QUESTION = 005

TABLE D2-50. PERCENTAGE OF ASSIGNED PERSONNEL IN LEARNING CYCLE - ENGINEERING

DEPARTMENT ENGINEERING	PERCENT	QUANTITY	COL.1 X COL.2
	05	002	= 0010
	06	001	= 0006
	10	017	= 0170
	15	007	= 0105
	20	029	= 0580
	25	025	= 0625
	30	029	= 0870
	33	006	= 0198
	35	010	= 0350
	40	025	= 1000
	45	001	= 0045
	50	041	= 2050
	55	001	= 0055
	60	007	= 0420
	65	004	= 0260
	70	005	= 0350
	75	005	= 0375
	77	001	= 0077
	80	008	= 0640
	85	002	= 0170
	90	002	= 0180
	99	001	= 0099
		---	----
		229	= 8635

AVERAGE NUMBER OF PERSONNEL IN TRAINING CYCLE = 37.70%
NUMBER OF OFFICERS NOT ANSWERING QUESTION = 006

TABLE D2-51. PERCENTAGE OF ASSIGNED PERSONNEL IN LEARNING CYCLE - DECK/WEAPONS

OPERATIONS DECK/WEAPONS	PERCENT	QUANTITY	COL.1 X COL.2
	02	001	= 0002
	03	001	= 0003
	05	005	= 0025
	10	012	= 0120
	15	005	= 0075
	20	013	= 0260
	25	014	= 0350
	30	020	= 0600
	33	005	= 0165
	35	003	= 0105
	40	025	= 1000
	45	004	= 0180
	50	039	= 1950
	60	017	= 1020
	65	001	= 0065
	70	014	= 0980
	73	001	= 0073
	75	020	= 1500
	80	018	= 1440
	85	002	= 0170
	90	004	= 0360
	95	004	= 0380
	99	001	= 0099
		---	----
		229	10922

AVERAGE NUMBER OF PERSONNEL IN TRAINING CYCLE = 48.69%
NUMBER OF OFFICERS NOT ANSWERING QUESTION = 006

Question 15 - Proportion of Operations Department in Learning Cycle on Present or Latest Ship.

The opinion of the survey group is that 49% of officers in the Navigation Division, 55% of the officers in the CIC/ASW Division and 54% of officers in the Communications Division are in the learning cycle and not fully able to complete all job functions. Similarly 38%, 43% and 34% of crewmen assigned to those Divisions are in the training cycle. Tables D2-52 to D2-57 show these breakdowns.

TABLE D2-52. OFFICERS IN NAVIGATION LEARNING CYCLE (IN PERCENT)

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=028

PERCENT	QUANTITY	COL.1 X COL.2
01	002	0002
03	001	0003
05	007	0035
06	001	0006
10	007	0070
12	001	0012
15	002	0030
20	014	0280
25	010	0250
30	017	0510
33	007	0231
40	010	0400
50	061	3050
60	005	0300
66	011	0726
67	004	0268
70	004	0280
75	015	1125
80	005	0400
85	C01	0085
90	004	0360
95	003	0285
99	015	1485
	---	----
	207	10193

THE AVERAGE PERCENTAGE = 49.24%

TABLE D2-53. CREWMEN IN NAVIGATION LEARNING CYCLE (IN PERCENT)

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=016

PERCENT	QUANTITY	COL.1 X COL.2
01	001	0001
02	001	0002
03	001	0003
05	005	0025
06	001	0006
10	015	0150
12	001	0012
15	001	0015
20	026	0520
25	037	0925
30	022	0660
33	005	0165
34	001	0034
35	004	0140
40	016	0640
45	001	0045
50	040	2000
60	011	0660
67	001	0067
70	009	0630
75	006	0450
80	010	0800
90	002	0180
95	001	0095
99	001	0099
	---	----
	219	08324

THE AVERAGE PERCENTAGE = 38.00%

TABLE D2-54. OFFICERS IN CIC/ASW LEARNING CYCLE (IN PERCENT)

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=055

PERCENT	QUANTITY	COL.1 X COL.2
05	002	0010
06	001	0006
08	001	0008
10	008	0080
12	001	0012
20	007	0140
25	009	0225
30	011	0330
33	004	0132
35	001	0035
40	010	0400
50	061	3050
60	004	0240
66	006	0396
67	001	0067
70	004	0280
75	012	0900
80	004	0320
90	003	0270
95	004	0380
99	026	2574
	---	----
	180	09855

THE AVERAGE PERCENTAGE = 54.75%

TABLE D2-55. CREWMEN IN CIC/ASW LEARNING CYCLE (IN PERCENT)

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=061

PERCENT	QUANTITY	COL.1 X COL.2
02	001	0002
05	003	0015
06	001	0006
10	008	0080
12	001	0012
15	004	0060
20	016	0320
24	001	0024
25	015	0375
30	023	0690
33	003	0099
35	003	0105
40	008	0320
45	001	0045
50	048	2400
60	010	0600
66	001	0066
67	001	0067
70	004	0280
75	006	0450
80	007	0560
90	002	0180
99	007	0693
	---	----
	174	07449

THE AVERAGE PERCENTAGE = 42.81%

TABLE D2-56. OFFICERS IN COMMUNICATIONS LEARNING CYCLE (IN PERCENT)

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=039

PERCENT	QUANTITY	COL.1 X COL.2
03	001	0003
05	004	0020
10	013	0130
12	002	0024
15	002	0030
20	012	0240
24	001	0024
25	007	0175
30	009	0270
33	003	0099
40	007	0280
50	063	3150
60	004	0240
66	004	0264
70	004	0280
75	016	1200
80	005	0400
90	008	0720
95	003	0285
99	028	2772
	---	----
	196	10606

THE AVERAGE PERCENTAGE = 54.11%

TABLE D2-57. CREWMEN IN COMMUNICATIONS LEARNING CYCLE (IN PERCENT)

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=032

PERCENT	QUANTITY	COL.1 X COL.2
02	001	0002
05	006	0030
10	024	0240
15	003	0045
20	030	0600
24	001	0024
25	028	0700
30	025	0750
33	008	0264
35	004	0140
40	015	0600
45	001	0045
50	029	1450
60	008	0480
65	002	0130
66	001	0066
67	002	0134
70	004	0280
75	004	0300
80	004	0320
90	002	0180
99	001	0099
	---	----
	203	06879

THE AVERAGE PERCENTAGE = 33.88%

Question 16 - Missions of Latest Ships and Readiness to Perform that Mission.

The survey group was asked to identify those missions for which their latest ship had responsibility and to judge the readiness of that ship to fulfill those responsibilities. The following table shows the number of officers and the percentage of the group who selected each mission as a responsibility of their latest ship and their judgement of that ship's readiness to fulfill those missions.

TABLE D2-58. MISSIONS OF LATEST SHIPS AND READINESS TO PERFORM THAT MISSION

Mission Responsibility	# Selected	% Selected	Estimated Readiness*
Enforcement of L & T	180	76.6	3.4
Domestic Icebreaking	45	19.1	3.7
Marine Envirn. Protection	66	28.1	2.6
Military Preparedness	177	75.3	3.3
Military Ops (Combat)	37	15.7	3.2
Polar Ops	26	11.1	3.6
SAR	212	90.2	3.8
Aids to Navigation	76	32.3	3.9
Marine Sciences	104	44.3	3.6
Ocean Station	41	17.4	4.2

*These ratings are on the following scale:

1 - Completely Unacceptable
2 -
3 - Minimally Acceptable
4 -
5 - Completely Acceptable

It will be seen that preparedness for all but one mission is considered more than minimally acceptable, but that preparedness for Marine Environmental Protection is considered unacceptable.

Tables D2-59 through D2-68 show the data for each of the missions individually.

TABLE D2-59. ESTIMATED ACTUAL READINESS TO PERFORM ENFORCEMENT OF LAWS & TREATIES MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=055

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=180

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS		
1=	010	= 005.55 %
2=	021	= 011.66 %
3=	063	= 035.00 %
4=	062	= 034.44 %
5=	024	= 013.33 %

TABLE D2-60. ESTIMATED ACTUAL READINESS TO PERFORM DOMESTIC ICEBREAKING MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=190

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=045

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS		
1=	008	= 017.77 %
2=	001	= 002.22 %
3=	007	= 015.55 %
4=	011	= 024.44 %
5=	018	= 040.00 %

TABLE D2-61. ESTIMATED ACTUAL READINESS TO PERFORM MARINE ENVIRONMENTAL PROTECTION MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=169

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=066

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS

1=	012	= 018.18 %
2=	017	= 025.75 %
3=	022	= 033.33 %
4=	014	= 021.21 %
5=	001	= 001.51 %

TABLE D2-62. ESTIMATED ACTUAL READINESS TO PERFORM MILITARY PREPAREDNESS MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS.NOT ANSWERING QUESTION=058

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=177

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=001

ESTIMATED ACTUAL READINESS

1=	010	= 005.64 %
2=	022	= 012.42 %
3=	067	= 037.85 %
4=	064	= 036.15 %
5=	013	= 007.34 %

TABLE D2-63. ESTIMATED ACTUAL READINESS TO PERFORM MILITARY OPERATIONS (COMBAT) MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=198

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=037

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS

1=	004	= 010.81 %
2=	004	= 010.81 %
3=	012	= 032.43 %
4=	014	= 037.83 %
5=	003	= 008.10 %

TABLE D2-64. ESTIMATED ACTUAL READINESS TO PERFORM POLAR OPERATIONS MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=209

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=026

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS

1=	004	= 015.38 %
2=	003	= 011.53 %
3=	002	= 007.69 %
4=	007	= 026.92 %
5=	010	= 038.46 %

TABLE D2-65. ESTIMATED ACTUAL READINESS TO PERFORM SEARCH & RESCUE MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=023

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=212

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS

1=	008	= 003.77 %
2=	013	= 006.13 %
3=	042	= 019.81 %
4=	090	= 042.45 %
5=	059	= 027.83 %

TABLE D2-66. ESTIMATED ACTUAL READINESS TO PERFORM AIDS TO NAVIGATION MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=159

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=076

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS

1=	011	= 014.47 %
2=	003	= 003.94 %
3=	004	= 005.26 %
4=	020	= 026.31 %
5=	038	= 050.00 %

TABLE D2-67. ESTIMATED ACTUAL READINESS TO PERFORM MARINE SCIENCE ACTIVITIES MISSION

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=131

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=104

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS

1=	006	= 005.76 %
2=	011	= 010.57 %
3=	025	= 024.03 %
4=	041	= 039.42 %
5=	021	= 020.19 %

TABLE D2-68. ESTIMATED ACTUAL READINESS TO PERFORM OCEAN STATION MISSION.

NUMBER OF OFFICERS SURVEYED = 235

NUMBER OF OFFICERS NOT ANSWERING QUESTION=194

NUMBER OF OFFICERS ANSWERING MISSION RESPONSIBILITIES=041

NUMBER OF OFFICERS NOT ANSWERING EST. ACTUAL READINESS=000

ESTIMATED ACTUAL READINESS

1=	004	= 009.75 %
2=	000	= 000.00 %
3=	002	= 004.87 %
4=	012	= 029.26 %
5=	023	= 056.09 %

Question 17 - Significance of Operational Functions in Various Missions.

The text of this question, the rating scale used and the responses of the survey group are summarized in Table D2-69. At the bottom of each column representing an operational function is the average rating for that function across all missions. It is seen that the "Bridge/Navigation Ops" and "Shiphandling" functions are rated "Above Normal Significance" across all missions as well as above "Normal Significance" for each mission. Not surprisingly, "ASW Ops" and "Gunnery" are rated relatively lower in significance across all missions, but very high in connection with military activities.

Tables D2-70 through D2-79 present summaries of responses to each mission/function in the matrix.

TABLE D2-69.

17. Use the following rating scale to associate the significance of the operational functions with the indicated USCG missions:

Rating Scale:

0 - Not Significant
1 - Low Significance
2 - Below Normal Significance
3 - Normal Significance
4 - Above Normal Significance
5 - High Significance
6 - Not Relevant

MISSIONS	OPERATIONAL FUNCTION										
	ASW Ops	CIC Ops	SAR Ops	Air/ Helo Flght Deck	Comm	Brdg/ Nav Ops	Ship- hand- ling	Gun- nery	Deck Sea- man- ship	Dam- age Cntrl	En- gin- eering
a. Enforcement of Laws and Treaties	1.9	4.0	2.8	4.5	4.4	4.4	4.0	2.9	3.6	2.9	3.4
b. Domestic Ice-breaking	1.8	3.0	2.8	3.3	3.4	4.3	4.7	1.8	3.4	3.8	4.0
c. Marine Environ-mental Protection	1.6	2.8	2.6	3.6	3.5	3.5	3.2	2.2	3.2	2.8	3.1
d. Military Preparedness	4.8	4.8	3.2	3.9	4.7	4.4	4.1	4.8	3.9	4.8	4.5
e. Military Opera-tions (Combat)	4.9	4.9	3.4	4.0	4.0	4.9	4.6	4.8	4.6	4.0	5.0
f. Polar Operations	2.2	3.2	3.0	4.5	3.6	4.1	4.3	3.9	4.2	4.5	2.0
g. Search and Rescue	2.0	4.5	5.0	4.5	4.6	4.4	4.1	2.4	4.2	3.2	3.5
h. Aids to Navigation	1.4	3.1	2.6	2.2	3.0	4.7	4.9	1.7	4.9	3.3	3.6
i. Marine Science Activities	2.4	3.1	2.5	2.7	3.0	3.6	3.7	2.1	3.6	2.9	3.2
j. Ocean Station	2.5	4.1	3.6	2.4	4.2	3.6	3.0	2.3	2.9	3.0	3.3
Overall Average	2.6	3.8	3.2	3.5	3.8	4.2	4.1	2.9	3.5	3.6	3.6

TABLE D2-70.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

A. ENFORCEMENT OF LAWS AND TREATIES

ASW OPS

0	081			
1 X	015=0015			
2 X	008=0016			
3 X	007=0021			
4 X	002=0008			
5 X	000=0000			
6	113			
7	009			
TOTALS	0032	00060	ANS	01.87

CIC OPS

0	003			
1 X	003=0003			
2 X	009=0018			
3 X	058=0174			
4 X	058=0232			
5 X	086=0430			
6	011			
7	007			
TOTALS	0214	00857	ANS	04.00

SAR OPS

0	034			
1 X	022=0022			
2 X	022=0044			
3 X	079=0237			
4 X	019=0076			
5 X	006=0030			
6	047			
7	006			
TOTALS	0148	00409	ANS	02.76

AIR/HELO FLIGHT DECK

0	005			
1 X	004=0004			
2 X	001=0002			
3 X	034=0102			
4 X	066=0264			
5 X	109=0545			
6	008			
7	008			
TOTALS	0214	00917	ANS	04.28

TABLE D2-70. (Continued)
A. ENFORCEMENT OF LAWS AND TREATIES

COMMUNICATIONS

0	001			
1 X	002=0002			
2 X	000=0000			
3 X	045=0135			
4 X	049=0196			
5 X	131=0655			
6	002			
7	005			
TOTALS	0227	00988	ANS	04.35

BRIDGE/NAV OPS

0	001			
1 X	003=0003			
2 X	001=0002			
3 X	033=0099			
4 X	052=0208			
5 X	138=0690			
6	002			
7	005			
TOTALS	0227	01002	ANS	04.41

SHIPHANDLING

0	001			
1 X	003=0003			
2 X	005=0010			
3 X	069=0207			
4 X	070=0280			
5 X.	081=0405			
6	002			
7	004			
TOTALS	0228	00905	ANS	03.96

GUNNERY

0	012			
1 X	028=0028			
2 X	025=0050			
3 X	097=0291			
4 X	039=0156			
5 X	013=0065			
6	015			
7	006			
TOTALS	0202	00590	ANS	02.92

TABLE D2-70. (Continued)
A. ENFORCEMENT OF LAWS AND TREATIES

DECK SEAMANSHIP					
	0	002			
	1 X	002=0002			
	2 X	013=0026			
	3 X	096=0288			
	4 X	066=0264			
	5 X	048=0240			
	6	003			
	7	005			
TOTALS		0225	00820	ANS	03.64
DAMAGE CONTROL					
	0	019			
	1 X	021=0021			
	2 X	017=0034			
	3 X	119=0357			
	4 X	015=0060			
	5 X	012=0060			
	6	025			
	7	007			
TOTALS		0184	00532	ANS	02.89
ENGINEERING					
	0	010			
	1 X	009=0009			
	2 X	008=0016			
	3 X	123=0369			
	4 X	029=0116			
	5 X	038=0190			
	6	013			
	7	005			
TOTALS		0207	00700	ANS	03.38

TABLE D2-71.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

B. DOMESTIC ICEBREAKING

ASW OPS

0	072		
1 X	004=0004		
2 X	002=0004		
3 X	002=0006		
4 X	000=0000		
5 X	000=0000		
6	132		
7	023		
TOTALS	0008	00014	ANS 01.75

CIC OPS

0	023		
1 X	014=0014		
2 X	015=0030		
3 X	097=0291		
4 X	019=0076		
5 X	016=0080		
6	029		
7	022		
TOTALS	0161	00491	ANS 03.04

SAR OPS

0	038		
1 X	019=0019		
2 X	009=0018		
3 X	088=0264		
4 X	009=0036		
5 X	007=0035		
6	042		
7	023		
TOTALS	0132	00372	ANS 02.81

AIR/HELO FLIGHT DECK

0	032		
1 X	019=0019		
2 X	010=0020		
3 X	048=0144		
4 X	047=0188		
5 X	023=0115		
6	033		
7	023		
TOTALS	0147	00486	ANS 03.30

TABLE D2-71. (Continued)
B. DOMESTIC ICEBREAKING

COMMUNICATIONS

	0	011			
	1 X	008=0008			
	2 X	004=0008			
	3 X	122=0366			
	4 X	027=0108			
	5 X	033=0165			
	6	009			
	7	021			
TOTALS		0194	00655	ANS	03.37

BRIDGE/NAV OPS

	0	010			
	1 X	001=0001			
	2 X	002=0004			
	3 X	034=0102			
	4 X	058=0232			
	5 X	099=0495			
	6	009			
	7	022			
TOTALS		0194	00834	ANS	04.29

SHIPHANDLING

	0	008			
	1 X	000=0000			
	2 X	000=0000			
	3 X	011=0033			
	4 X	037=0148			
	5 X	149=0745			
	6	008			
	7	022			
TOTALS		0197	00926	ANS	04.70

GUNNERY

	0	072			
	1 X	012=0012			
	2 X	005=0010			
	3 X	006=0018			
	4 X	001=0004			
	5 X	000=0000			
	6	116			
	7	023			
TOTALS		0024	00044	ANS	01.83

TABLE D2-71. (Continued)
B. DOMESTIC ICEBREAKING

DECK SEAMANSHIP

	0	012			
	1	X 008=0008			
	2	X 007=0014			
	3	X 092=0276			
	4	X 063=0252			
	5	X 023=0115			
	6	009			
	7	021			
TOTALS		0193	00665	ANS	03.44

DAMAGE CONTROL

	0	009			
	1	X 004=0004			
	2	X 003=0006			
	3	X 067=0201			
	4	X 072=0288			
	5	X 048=0240			
	6	011			
	7	021			
TOTALS		0194	00739	ANS	03.80

ENGINEERING

	0	009			
	1	X 000=0000			
	2	X 003=0006			
	3	X 061=0183			
	4	X 063=0252			
	5	X 071=0355			
	6	008			
	7	020			
TOTALS		0198	00796	ANS	04.02

TABLE D2-72.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

C. MARINE ENVIRONMENTAL PROTECTION

ASW OPS

0	075				
1 X	004=0004				
2 X	000=0000				
3 X	000=0000				
4 X	001=0004				
5 X	000=0000				
6	128				
7	027				
TOTALS	0005	00008	ANS	01.60	

CIC OPS

0	040			
1 X	016=0016			
2 X	014=0028			
3 X	073=0219			
4 X	009=0036			
5 X	009=0045			
6	047			
7	027			
TOTALS	0121	00344	ANS	02.84

SAR OPS

0	039			
1 X	023=0023			
2 X	015=0030			
3 X	059=0177			
4 X	007=0028			
5 X	003=0015			
6	064			
7	025			
TOTALS	0107	00273	ANS	02.55

AIR/HELO FLIGHT DECK

0	017			
1 X	007=0007			
2 X	009=0018			
3 X	067=0201			
4 X	062=0248			
5 X	031=0155			
6	016			
7	026			
TOTALS	0176	00629	ANS	03.57

TABLE D2-72. (Continued)
C. MARINE ENVIRONMENTAL PROTECTION

COMMUNICATIONS				
	0 010			
	1 X 004=0004			
	2 X 009=0018			
	3 X 104=0312			
	4 X 043=0172			
	5 X 033=0165			
	6 008			
	7 024			
TOTALS	0193	00671	ANS	03.47
BRIDGE/NAV OPS				
	0 008			
	1 X 003=0003			
	2 X 013=0026			
	3 X 099=0297			
	4 X 049=0196			
	5 X 030=0150			
	6 009			
	7 024			
TOTALS	0194	00672	ANS	03.46
SHIPHANDLING				
	0 008			
	1 X 011=0011			
	2 X 016=0032			
	3 X 107=0321			
	4 X 039=0156			
	5 X 021=0105			
	6 009			
	7 024			
TOTALS	0194	00625	ANS	03.22
GUNNERY				
	0 066			
	1 X 011=0011			
	2 X 008=0016			
	3 X 016=0048			
	4 X 000=0000			
	5 X 001=0005			
	6 108			
	7 025			
TOTALS	0036	00080	ANS	02.22

TABLE D2-72 (Continued)

C. MARINE ENVIRONMENTAL PROTECTION

DECK SEAMANSHIP

	0 013			
	1 X 009=0009			
	2 X 012=0024			
	3 X 110=0330			
	4 X 038=0152			
	5 X 016=0080			
	6 013			
	7 024			
TOTALS	0185	00595	ANS	03.21

DAMAGE CONTROL

	0 021			
	1 X 018=0018			
	2 X 016=0032			
	3 X 108=0324			
	4 X 010=0040			
	5 X 008=0040			
	6 029			
	7 025			
TOTALS	0160	00454	ANS	02.83

ENGINEERING

	0 012			
	1 X 016=0016			
	2 X 007=0014			
	3 X 125=0375			
	4 X 012=0048			
	5 X 022=0110			
	6 017			
	7 024			
TOTALS	0182	00563	ANS	03.09

TABLE D2-73.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

D. MILITARY PREPAREDNESS

ASW OPS

0	002			
1 X	000=0000			
2 X	000=0000			
3 X	009=0027			
4 X	019=0076			
5 X	181=0905			
6	010			
7	014			
TOTALS	0209	01008	ANS	04.82

CIC OPS

0	001			
1 X	000=0000			
2 X	000=0000			
3 X	005=0015			
4 X	022=0088			
5 X	189=0945			
6	006			
7	012			
TOTALS	0216	01048	ANS	04.85

SAR OPS

0	005			
1 X	016=0016			
2 X	016=0032			
3 X	111=0333			
4 X	040=0160			
5 X	020=0100			
6	016			
7	011			
TOTALS	0203	00641	ANS	03.15

AIR/HELO FLIGHT DECK

0	009			
1 X	004=0004			
2 X	010=0020			
3 X	061=0183			
4 X	048=0192			
5 X	075=0375			
6	015			
7	013			
TOTALS	0198	00774	ANS	03.90

TABLE D2-73. (Continued)
D. MILITARY PREPAREDNESS

COMMUNICATIONS

0	001			
1 X	000=0000			
2 X	001=0002			
3 X	016=0048			
4 X	036=0144			
5 X	167=0835			
6	004			
7	010			
TOTALS	0220	01029	ANS	04.67

BRIDGE/NAV OPS

0	001			
1 X	001=0001			
2 X	000=0000			
3 X	032=0096			
4 X	055=0220			
5 X	132=0660			
6	004			
7	010			
TOTALS	0220	00977	ANS	04.44

SHIPHANDLING

0	002			
1 X	001=0001			
2 X	002=0004			
3 X	062=0186			
4 X	057=0228			
5 X	097=0485			
6	004			
7	010			
TOTALS	0219	00904	ANS	04.12

GUNNERY

0	000			
1 X	000=0000			
2 X	001=0002			
3 X	005=0015			
4 X	021=0084			
5 X	193=0965			
6	006			
7	009			
TOTALS	0220	01066	ANS	04.84

TABLE D2-73. (Continued)
D. MILITARY PREPAREDNESS

DECK SEAMANSHIP

	0	002				
	1	X 000=0000				
	2	X 003=0006				
	3	X 085=0255				
	4	X 064=0256				
	5	X 065=0325				
	6	004				
	7	012				
TOTALS		0217	00842	ANS	03.88	

DAMAGE CONTROL

	0	000			
	1	X 000=0000			
	2	X 000=0000			
	3	X 010=0030			
	4	X 026=0104			
	5	X 185=0925			
	6	004			
	7	010			
TOTALS		0221	01059	ANS	04.79

ENGINEERING

	0	000			
	1	X 000=0000			
	2	X 000=0000			
	3	X 025=0075			
	4	X 063=0252			
	5	X 133=0665			
	6	004			
	7	010			
TOTALS		0221	00992	ANS	04.48

TABLE D2-74.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

E. MILITARY OPERATIONS (COMBAT)

ASW OPS

0	002			
1	X 001=0001			
2	X 000=0000			
3	X 008=0024			
4	X 008=0032			
5	X 185=0925			
6	010			
7	021			
TOTALS	0202	00982	ANS	04.86

CIC OPS

0	002			
1	X 000=0000			
2	X 000=0000			
3	X 003=0009			
4	X 009=0036			
5	X 191=0955			
6	009			
7	021			
TOTALS	0203	01000	ANS	04.92

SAR OPS

0	005			
1	X 011=0011			
2	X 017=0034			
3	X 082=0246			
4	X 039=0156			
5	X 042=0210			
6	019			
7	020			
TOTALS	0191	00657	ANS	03.43

AIR/HELO FLIGHT DECK

0	006			
1	X 008=0008			
2	X 007=0014			
3	X 048=0144			
4	X 044=0176			
5	X 084=0420			
6	017			
7	121			
TOTALS	0191	00762	ANS	03.98

TABLE D2-74. (Continued)
E. MILITARY OPERATIONS (COMBAT)

DECK SEAMANSHIP

	0	002			
	1 X	000=0000			
	2 X	004=0008			
	3 X	070=0210			
	4 X	051=0204			
	5 X	076=0380			
	6	010			
	7	022			
TOTALS		0201	00802	ANS	03.99

DAMAGE CONTROL

	0	001			
	1 X	000=0000			
	2 X	000=0000			
	3 X	003=0009			
	4 X	010=0040			
	5 X	193=0965			
	6	009			
	7	019			
TOTALS		0206	01014	ANS	04.92

ENGINEERING

	0	001			
	1 X	000=0000			
	2 X	000=0000			
	3 X	016=0048			
	4 X	038=0152			
	5 X	151=0755			
	6	009			
	7	020			
TOTALS		0205	00955	ANS	04.65

TABLE D2-74. (Continued)
E. MILITARY OPERATIONS (COMBAT)

COMMUNICATIONS

	0 001			
	1 X 000=0000			
	2 X 000=0000			
	3 X 009=0027			
	4 X 024=0096			
	5 X 172=0860			
	6 009			
	7 020			
TOTALS	0205	00983	ANS	04.79

BRIDGE/NAV OPS

	0 001			
	1 X 000=0000			
	2 X 000=0000			
	3 X 022=0066			
	4 X 038=0152			
	5 X 145=0725			
	6 009			
	7 020			
TOTALS	0205	00943	ANS	04.60

SHIPHANDLING

	0 001			
	1 X 000=0000			
	2 X 000=0000			
	3 X 037=0111			
	4 X 050=0200			
	5 X 118=0590			
	6 009			
	7 020			
TOTALS	0205	00901	ANS	04.39

GUNNERY

	0 001			
	1 X 000=0000			
	2 X 000=0000			
	3 X 001=0003			
	4 X 005=0020			
	5 X 199=0995			
	6 009			
	7 020			
TOTALS	0205	01018	ANS	04.96

TABLE D2-75.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

F. POLAR OPERATIONS

ASW OPS

	0	065		
	1 X	012=0012		
	2 X	007=0014		
	3 X	015=0045		
	4 X	001=0004		
	5 X	001=0005		
	6	105		
	7	029		
TOTALS		0036 00080	ANS	02.22

CIC OPS

	0	020		
	1 X	009=0009		
	2 X	016=0032		
	3 X	084=0252		
	4 X	032=0128		
	5 X	021=0105		
	6	025		
	7	028		
TOTALS		0162 00526	ANS	03.24

SAR OPS

	0	018		
	1 X	017=0017		
	2 X	019=0038		
	3 X	091=0273		
	4 X	024=0096		
	5 X	012=0060		
	6	025		
	7	029		
TOTALS		0163 00484	ANS	02.96

AIR/HELO FLIGHT DECK

	0	012		
	1 X	000=0000		
	2 X	000=0000		
	3 X	017=0051		
	4 X	051=0204		
	5 X	114=0570		
	6	013		
	7	028		
TOTALS		0182 00825	ANS	04.53

TABLE D2-75. (Continued)
F. POLAR OPERATIONS

DECK SEAMANSHIP

	0 013			
	1 X 002=0002			
	2 X 013=0026			
	3 X 071=0213			
	4 X 071=0284			
	5 X 025=0125			
	6 012			
	7 028			
TOTALS	0182	00650	ANS	03.57

DAMAGE CONTROL

	0 010			
	1 X 001=0001			
	2 X 004=0008			
	3 X 048=0144			
	4 X 059=0236			
	5 X 070=0350			
	6 015			
	7 028			
TOTALS	0182	00739	ANS	04.06

ENGINEERING

	0 009			
	1 X 001=0001			
	2 X 001=0002			
	3 X 041=0123			
	4 X 044=0176			
	5 X 099=0495			
	6 011			
	7 029			
TOTALS	0186	00797	ANS	04.28

TABLE D2-75. (Continued)
F. POLAR OPERATIONS

COMMUNICATIONS

	0	014		
	1 X	001=0001		
	2 X	000=0000		
	3 X	071=0213		
	4 X	051=0204		
	5 X	058=0290		
	6	012		
	7	028		
TOTALS		0181 00708	ANS	03.91

BRIDGE/NAV OPS

	0	011		
	1 X	000=0000		
	2 X	002=0004		
	3 X	033=0099		
	4 X	064=0256		
	5 X	084=0420		
	6	013		
	7	028		
TOTALS		0183 00779	ANS	04.25

SHIPHANDLING

	0	009		
	1 X	000=0000		
	2 X	000=0000		
	3 X	024=0072		
	4 X	039=0156		
	5 X	123=0615		
	6	012		
	7	028		
TOTALS		0186 00843	ANS	04.53

GUNNERY

	0	054		
	1 X	023=0023		
	2 X	010=0020		
	3 X	024=0072		
	4 X	000=0000		
	5 X	000=0000		
	6	095		
	7	029		
TOTALS		0057 00115	ANS	02.01

TABLE D2-76.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

G. SEARCH AND RESCUE

ASW OPS

0	068			
1 X	019=0019			
2 X	016=0032			
3 X	014=0042			
4 X	002=0008			
5 X	000=0000			
6	109			
7	007			
TOTALS	0051	00101	ANS	01.98

CIC OPS

0	006			
1 X	002=0002			
2 X	001=0002			
3 X	018=0054			
4 X	060=0240			
5 X	136=0680			
6	007			
7	005			
TOTALS	0217	00978	ANS	04.50

SAR OPS

0	004			
1 X	000=0000			
2 X	000=0000			
3 X	002=0006			
4 X	004=0016			
5 X	218=1090			
6	003			
7	004			
TOTALS	0224	01112	ANS	04.96

AIR/HELO FLIGHT DECK

0	005			
1 X	000=0000			
2 X	000=0000			
3 X	025=0075			
4 X	054=0216			
5 X	141=0705			
6	005			
7	005			
TOTALS	0220	00996	ANS	04.52

TABLE D2-76. (Continued)
G. SEARCH AND RESCUE

COMMUNICATIONS

0	003			
1 X	000=0000			
2 X	000=0000			
3 X	015=0045			
4 X	067=0268			
5 X	144=0720			
6	003			
7	003			
TOTALS	0226	01033	ANS	04.57

BRIDGE/NAV OPS

0	003			
1 X	000=0000			
2 X	001=0002			
3 X	030=0090			
4 X	079=0316			
5 X	116=0580			
6	004			
7	002			
TOTALS	0226	00988	ANS	04.37

SHIPHANDLING

0	004			
1 X	001=0001			
2 X	004=0008			
3 X	050=0150			
4 X	082=0328			
5 X	087=0435			
6	004			
7	003			
TOTALS	0224	00922	ANS	04.11

GUNNERY

0	040			
1 X	032=0032			
2 X	019=0038			
3 X	053=0159			
4 X	015=0060			
5 X	000=0000			
6	072			
7	004			
TOTALS	0119	00289	ANS	02.42

TABLE D2-76. (Continued)
G. SEARCH AND RESCUE

DECK SEAMANSHIP

0	004			
1 X	000=0000			
2 X	000=0000			
3 X	039=0117			
4 X	094=0376			
5 X	091=0455			
6	004			
7	003			
TOTALS	0224	00948	ANS	04.23

DAMAGE CONTROL

0	009			
1 X	008=0008			
2 X	018=0036			
3 X	128=0384			
4 X	025=0100			
5 X	023=0115			
6	020			
7	004			
TOTALS	0202	00643	ANS	03.18

ENGINEERING

0	008			
1 X	005=0005			
2 X	005=0010			
3 X	127=0381			
4 X	035=0140			
5 X	045=0225			
6	007			
7	003			
TOTALS	0217	00761	ANS	03.50

TABLE D2-77.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

H. AIDS TO NAVIGATION

ASW OPS

0	079			
1 X	006=0006			
2 X	001=0002			
3 X	001=0003			
4 X	000=0000			
5 X	000=0000			
6	129			
7	019			
TOTALS	0008	00011	ANS	01.37

CIC OPS

0	040			
1 X	019=0019			
2 X	010=0020			
3 X	051=0153			
4 X	025=0100			
5 X	020=0100			
6	052			
7	018			
TOTALS	0125	00392	ANS	03.13

SAR OPS.

0	035			
1 X	018=0018			
2 X	021=0042			
3 X	068=0204			
4 X	007=0028			
5 X	002=0010			
6	065			
7	019			
TOTALS	0116	00302	ANS	02.60

AIR/HELO FLIGHT DECK

0	066			
1 X	022=0022			
2 X	015=0030			
3 X	018=0054			
4 X	004=0016			
5 X	002=0010			
6	089			
7	019			
TOTALS	0061	00132	ANS	02.16

TABLE D2-77. (Continued)
H. AIDS TO NAVIGATION

COMMUNICATIONS

	0	011		
	1 X	011=0011		
	2 X	016=0032		
	3 X	149=0447		
	4 X	013=0052		
	5 X	010=0050		
	6	008		
	7	017		
TOTALS		0199	00592	ANS 02.97

BRIDGE/NAV OPS

	0	004		
	1 X	000=0000		
	2 X	001=0002		
	3 X	016=0048		
	4 X	033=0132		
	5 X	160=0800		
	6	005		
	7	016		
TOTALS		0210	00982	ANS 04.67

SHIPHANDLING

	0	003		
	1 X	000=0000		
	2 X	000=0000		
	3 X	002=0006		
	4 X	013=0052		
	5 X	198=0990		
	6	003		
	7	016		
TOTALS		0213	01048	ANS 04.92

GUNNERY

	0	075		
	1 X	011=0011		
	2 X	003=0006		
	3 X	005=0015		
	4 X	000=0000		
	5 X	000=0000		
	6	124		
	7	017		
TOTALS		0019	00032	ANS 01.68

TABLE D2-77. (Continued)

H. AIDS TO NAVIGATION

DECK SEAMANSHIP

0	003			
1 X	000=0000			
2 X	000=0000			
3 X	002=0006			
4 X	013=0052			
5 X	198=0990			
6	003			
7	016			
TOTALS	0213	01048	ANS	04.92

DAMAGE CONTROL

0	007			
1 X	009=0009			
2 X	013=0026			
3 X	116=0348			
4 X	039=0156			
5 X	022=0110			
6	012			
7	017			
TOTALS	0199	00649	ANS	03.26

ENGINEERING

0	004			
1 X	003=0003			
2 X	005=0010			
3 X	112=0336			
4 X	046=0184			
5 X	045=0225			
6	004			
7	016			
TOTALS	0211	00758	ANS	03.59

TABLE D2-78.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

I. MARINE SCIENCE ACTIVITIES

ASW OPS

0		065			
1	X	016=0016			
2	X	008=0016			
3	X	011=0033			
4	X	008=0032			
5	X	003=0015			
6		103			
7		021			
TOTALS		0046	00112	ANS	02.43

CIC OPS

0		027			
1	X	009=0009			
2	X	020=0040			
3	X	077=0231			
4	X	023=0092			
5	X	016=0080			
6		044			
7		019			
TOTALS		0145	00452	ANS	03.11

SAR OPS

0		047			
1	X	015=0015			
2	X	022=0044			
3	X	050=0150			
4	X	003=0012			
5	X	001=0005			
6		076			
7		021			
TOTALS		0091	00226	ANS	02.48

AIR/HELO FLIGHT DECK

0		042			
1	X	020=0020			
2	X	020=0040			
3	X	053=0159			
4	X	015=0060			
5	X	007=0035			
6		057			
7		021			
TOTALS		0115	00314	ANS	02.73

TABLE D2-78. (Continued)

I. MARINE SCIENCE ACTIVITIES

COMMUNICATIONS

0		012		
1	X	012=0012		
2	X	015=0030		
3	X	127=0381		
4	X	020=0080		
5	X	014=0070		
6		015		
7		020		
TOTALS		0188	00573	ANS 03.04

BRIDGE/NAV OPS

0		004		
1	X	003=0003		
2	X	007=0014		
3	X	095=0285		
4	X	056=0224		
5	X	042=0210		
6		009		
7		019		
TOTALS		0203	00736	ANS 03.62

SHIPHANDLING

0		004		
1	X	003=0003		
2	X	010=0020		
3	X	080=0240		
4	X	062=0248		
5	X	051=0255		
6		006		
7		019		
TOTALS		0206	00766	ANS 03.71

GUNNERY

0		073		
1	X	008=0008		
2	X	001=0002		
3	X	008=0024		
4	X	001=0004		
5	X	000=0000		
6		123		
7		021		
TOTALS		0018	00038	ANS 02.11

TABLE D2-78. (Continued)
I. MARINE SCIENCE ACTIVITIES

DECK SEAMANSHIP

0	007			
1 X	001=0001			
2 X	008=0016			
3 X	089=0267			
4 X	071=0284			
5 X	032=0160			
6	008			
7	019			
TOTALS	0201	00728	ANS	03.62

DAMAGE CONTROL

0	017			
1 X	014=0014			
2 X	018=0036			
3 X	119=0357			
4 X	003=0012			
5 X	011=0055			
6	032			
7	021			
TOTALS	0165	00474	ANS	02.87

ENGINEERING

0	012			
1 X	003=0003			
2 X	012=0024			
3 X	135=0405			
4 X	014=0056			
5 X	020=0100			
6	019			
7	020			
TOTALS	0184	00588	ANS	03.19

TABLE D2-79.

NUMBER OF OFFICERS SURVEYED = 235

THE FOLLOWING RATING SCALE ASSOCIATES THE SIGNIFICANCE OF THE OPERATIONAL FUNCTIONS WITH THE INDICATED USCG MISSIONS.

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	6=NOT RELEVANT
3=NO NORMAL SIG.	7=NOT ANSWERED

J. OCEAN STATION

ASW OPS

0	045			
1 X	021=0021			
2 X	015=0030			
3 X	044=0132			
4 X	009=0036			
5 X	002=0010			
6	075			
7	024			
TOTALS	0091	00229	ANS	02.51

CIC OPS

0	007			
1 X	000=0000			
2 X	003=0006			
3 X	047=0141			
4 X	071=0284			
5 X	072=0360			
6	012			
7	023			
TOTALS	0193	00791	ANS	04.09

SAR OPS

0	008			
1 X	005=0005			
2 X	005=0010			
3 X	082=0246			
4 X	057=0228			
5 X	038=0190			
6	016			
7	024			
TOTALS	0187	00679	ANS	03.63

AIR/HELO FLIGHT DECK

0	059			
1 X	021=0021			
2 X	015=0030			
3 X	037=0111			
4 X	003=0012			
5 X	004=0020			
6	072			
7	024			
TOTALS	0080	00194	ANS	02.42

TABLE D2-79. (Continued)
J. OCEAN STATION

COMMUNICATIONS

	0	004			
	1 X	000=0000			
	2 X	001=0002			
	3 X	043=0129			
	4 X	078=0312			
	5 X	075=0375			
	6	011			
	7	023			
TOTALS		0197	00818	ANS	04.15

BRIDGE/NAV OPS

	0	008			
	1 X	002=0002			
	2 X	007=0014			
	3 X	087=0261			
	4 X	061=0244			
	5 X	036=0180			
	6	011			
	7	023			
TOTALS		0193	00701	ANS	03.63

SHIPHANDLING

	0	014			
	1 X	008=0008			
	2 X	028=0056			
	3 X	121=0363			
	4 X	018=0072			
	5 X	013=0065			
	6	010			
	7	023			
TOTALS		0188	00564	ANS	03.00

GUNNERY

	0	049			
	1 X	026=0026			
	2 X	013=0026			
	3 X	048=0144			
	4 X	003=0012			
	5 X	000=0000			
	6	072			
	7	024			
TOTALS		0090	00208	ANS	02.31

TABLE D2-79. (Continued)
J. OCEAN STATION

DECK SEAMANSHIP

	0	011			
	1	X 011=0011			
	2	X 024=0048			
	3	X 128=0384			
	4	X 012=0048			
	5	X 009=0045			
	6	017			
	7	023			
TOTALS		0184	00536	ANS	02.91

DAMAGE CONTROL

	0	010			
	1	X 013=0013			
	2	X 015=0030			
	3	X 133=0399			
	4	X 009=0036			
	5	X 014=0070			
	6	017			
	7	024			
TOTALS		0184	00548	ANS	02.97

ENGINEERING

	0	008			
	1	X 003=0003			
	2	X 008=0016			
	3	X 134=0402			
	4	X 019=0076			
	5	X 027=0135			
	6	012			
	7	024			
TOTALS		0191	00632	ANS	03.30

Question 18 - Relate Significance of 8 Training Methods to 32 Operational Tasks.

This question, the rating system used and the tasks and training methods to be evaluated are shown in Table D2-80 along with the average ratings assigned by the survey group. The eight training methods were ranked as follows in terms of their overall significance across all tasks:

Rank	Training Methods	Overall Rating*
1	On-the-Job Training	4.3
2	REFTRA	3.7
3	Simulators	3.3
4	Fleet Exercises	3.0
5	Training Teams & STD's	3.0
6	Training Availability	2.9
7	Texts/Manuals/A-V	2.9
8	Classroom	2.9

*These rating values are defined in Table D2-80.

It should be noted that for some specific tasks there are wide variances from these average overall ratings. For instance, though Classroom training is rated low overall, it is rated very high for teaching Celestial Navigation and Station Keeping. There are many other cases of such wide variances. Table D2-80 shows the complete matrix of the rating assigned each of the training methods for each of the operational tasks. Tables D2-81 through D2-112 show the breakdowns of responses which provided the elements of the matrix.

TABLE D2-80.

18. This is a multiple element question which associates, in an ordered way, specific training methodologies with operational tasks within major categories. Please use the rating scale to associate the significance of the indicated training methods with the operational tasks listed for each category.

Rating Scale:

0 - Not Significant
1 - Low Significance
2 - Below Normal Significance
3 - Normal Significance
4 - Above Normal Significance
5 - High Significance
9 - Not Relevant

OPERATIONAL CATEGORY/ TASKS	TRAINING METHODS							
	Classroom (Formal, Individual)	On-The-Job Training	Simulators	Texts/Manuals/ Audio-Visual	Training Teams/ STD's	Training Availability	Refresher Training	Fleet Exercises
NAVIGATION								
Celestial	4.3	4.6	2.5	3.3	2.2	2.2	1.8	1.9
Piloting	3.8	4.7	3.5	2.2	3.4	2.9	3.9	2.7
Electronic	3.7	4.5	3.7	3.2	3.1	2.6	3.2	2.8
Fog	2.9	4.6	4.1	2.8	3.8	3.0	4.1	2.8
DECK								
Anchoring	2.4	4.7	2.6	2.7	2.6	2.6	3.9	2.2
Docking	2.5	4.9	3.1	2.6	2.3	2.6	3.4	2.2
Boat Lowering	2.4	4.9	2.6	2.5	2.6	2.7	2.9	2.2
Boat Handling	2.5	4.9	2.6	2.6	2.5	2.7	2.7	2.3
Towing	2.7	4.7	2.2	2.8	2.8	2.7	3.9	3.0
Helo Deck Ops	2.8	4.7	2.6	2.9	3.1	3.0	3.3	3.0
GUNNERY								
Spotting	3.0	4.3	3.4	2.9	2.9	3.0	4.4	3.5
Gun Mount Procedures	3.2	4.5	3.8	2.9	3.2	3.4	4.4	3.4
Fire Control	3.3	4.3	4.0	3.0	3.2	3.2	4.4	3.5
Liaison	3.0	4.1	3.4	2.7	3.0	3.0	4.3	3.5

TABLE D2-80. (Continued)

Rating Scale:

0 - Not Significant
1 - Low Significance
2 - Below Normal Significance
3 - Normal Significance
4 - Above Normal Significance
5 - High Significance
9 - Not Relevant

OPERATIONAL CATEGORY/ TASKS	Classroom (Formal, Individual)	On-The-Job Training	Simulators	Texts/Manuals/ Audio-Visual	Training Teams/ STD's	Training Availability	Refresher Training	Fleet Exercises
	TRAINING METHODS							
SHIP HANDLING								
Anchoring	2.7	4.7	2.8	2.8	2.9	2.9	3.9	2.7
Docking	2.6	4.9	3.3	2.7	2.6	2.9	3.7	2.6
Collision Avoidance	2.6	4.7	2.2	2.8	2.8	2.7	3.9	3.0
Rules of the Road	2.8	4.7	2.6	2.9	3.2	3.1	3.3	3.0
Ice Breaking	3.0	4.3	3.4	2.9	2.9	3.1	4.4	3.5
Heavy Weather	3.2	4.5	3.8	2.9	3.2	3.4	4.4	3.5
CIC								
Anti-Air (AAW)	3.3	4.5	3.9	3.0	3.2	3.2	4.4	3.5
Anti-Surface	3.0	4.1	3.4	2.7	3.0	3.0	4.3	3.5
Anti-Submarine (ASW)	2.7	4.7	2.8	2.8	2.9	2.9	3.9	2.7
Fog Navigation	2.6	4.9	3.3	2.7	2.6	2.9	3.7	2.6
Collision Avoidance	3.5	4.0	4.3	3.2	3.2	3.1	3.2	3.5
Stationing	4.4	3.9	3.9	3.9	3.4	3.3	3.0	3.1
SAR Air Control	2.7	4.8	2.7	3.0	3.1	2.2	1.9	1.9
COMMUNICATIONS								
Visual	2.9	4.4	2.6	3.2	2.3	2.4	2.2	2.4
Voice	3.2	3.7	4.2	3.0	3.2	3.1	4.3	3.9
On-Line Crypto	3.2	3.8	4.2	3.0	3.2	3.1	4.4	4.0
Off-Line Crypto	3.4	3.8	4.5	3.0	3.3	3.2	4.5	4.2
DAMAGE CONTROL	2.9	4.4	4.2	2.8	3.8	3.2	4.2	3.1
Avg. of All	2.9	4.3	3.3	2.9	3.0	2.9	3.7	3.0

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A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY--ETC(U)
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UNCLASSIFIED 3M080 USCG-C-1-77 NL

7 OF 8
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TABLE D2-81.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
 0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
 1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
 2=BELOW NORM. SIG. 9=NOT RELEVANT
 3=NORMAL SIG.

NAVIGATION / CELESTIAL

CLASSROOM (FORMAL, INDIVIDUAL)

0	003			
1 X 000 = 0000				
2 X 001 = 0002				
3 X 046 = 0138				
4 X 060 = 0240				
5 X 118 = 0590				
9	003			
NO ANS	004			
TOTALS	0225	00970	ANS	04.31

ON-THE-JOB TRAINING

0	002			
1 X 000 = 0000				
2 X 001 = 0002				
3 X 020 = 0060				
4 X 051 = 0204				
5 X 155 = 0775				
9	003			
NO ANS	003			
TOTALS	0227	01041	ANS	04.58

SIMULATORS

0	066			
1 X 031 = 0031				
2 X 023 = 0046				
3 X 033 = 0099				
4 X 020 = 0080				
5 X 005 = 0025				
9	045			
NO ANS	012			
TOTALS	0112	00281	ANS	02.50

TEXTS/MANUALS/AUDIO-VISUAL

0	005			
1 X 012 = 0012				
2 X 018 = 0036				
3 X 117 = 0351				
4 X 044 = 0176				
5 X 031 = 0155				
9	005			
NO ANS	003			
TOTALS	0222	00730	ANS	03.28

TABLE D2-81. (Continued)
NAVIGATION / CELESTIAL

TRAINING TEAMS/STD'S

0	073			
1 X 040 = 0040				
2 X 029 = 0058				
3 X 040 = 0120				
4 X 011 = 0044				
5 X 002 = 0010				
9	032			
NO ANS	008			
TOTALS	0122	00272	ANS	02.22

TRAINING AVAILABILITY

0	074			
1 X 046 = 0046				
2 X 019 = 0038				
3 X 041 = 0123				
4 X 009 = 0036				
5 X 004 = 0020				
9	030			
NO ANS	012			
TOTALS	0119	00263	ANS	02.21

REFRESHER TRAINING

0	088			
1 X 042 = 0042				
2 X 022 = 0044				
3 X 014 = 0042				
4 X 001 = 0004				
5 X 004 = 0020				
9	055			
NO ANS	009			
TOTALS	0083	00152	ANS	01.83

FLEET EXERCISES

0	078			
1 X 048 = 0048				
2 X 017 = 0034				
3 X 026 = 0078				
4 X 002 = 0008				
5 X 003 = 0015				
9	045			
NO ANS	016			
TOTALS	0096	00183	ANS	01.90

TABLE D2-82.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
- 0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
- 1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
- 2=BELOW NORM. SIG. 9=NOT RELEVANT
- 3=NORMAL SIG.

NAVIGATION / PILOTING

CLASSROOM (FORMAL, INDIVIDUAL)

0	003			
1 X	002 =	0002		
2 X	013 =	0026		
3 X	075 =	0225		
4 X	076 =	0304		
5 X	060 =	0300		
9	001			
NO ANS	005			
TOTALS	0226	00857	ANS	03.79

ON-THE-JOB TRAINING

0	001			
1 X	000 =	0000		
2 X	000 =	0000		
3 X	013 =	0039		
4 X	042 =	0168		
5 X	175 =	0875		
9	001			
NO ANS	003			
TOTALS	0230	01082	ANS	04.70

SIMULATORS

0	017			
1 X	022 =	0022		
2 X	017 =	0034		
3 X	057 =	0171		
4 X	052 =	0208		
5 X	049 =	0245		
9	014			
NO ANS	007			
TOTALS	0197	00680	ANS	03.45

TEXTS/MANUALS/AUDIO-VISUAL

0	005			
1 X	010 =	0010		
2 X	022 =	0044		
3 X	130 =	0390		
4 X	038 =	0152		
5 X	025 =	0125		
9	002			
NO ANS	003			
TOTALS	0225	00721	ANS	03.20

TABLE D2-82. (Continued)
NAVIGATION / PILOTING

TRAINING TEAMS/STD'S

0	008			
1 X 018 = 0018				
2 X 021 = 0042				
3 X 074 = 0222				
4 X 074 = 0296				
5 X 031 = 0155				
9	004			
NO ANS	005			
TOTALS	0218	00733	ANS	03.36

TRAINING AVAILABILITY

0	044			
1 X 025 = 0025				
2 X 025 = 0050				
3 X 074 = 0222				
4 X 030 = 0120				
5 X 013 = 0065				
9	015			
NO ANS	009			
TOTALS	0167	00482	ANS	02.88

REFRESHER TRAINING

0	015			
1 X 009 = 0009				
2 X 017 = 0034				
3 X 041 = 0123				
4 X 065 = 0260				
5 X 076 = 0380				
9	007			
NO ANS	005			
TOTALS	0208	00806	ANS	03.87

FLEET EXERCISES

0	052			
1 X 028 = 0028				
2 X 018 = 0036				
3 X 064 = 0192				
4 X 016 = 0064				
5 X 012 = 0060				
9	033			
NO ANS	012			
TOTALS	0138	00380	ANS	02.75

TABLE D2-83.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

NAVIGATION / ELECTRONIC

CLASSROOM (FORMAL, INDIVIDUAL)

0	003			
1 X 001 =	0001			
2 X 016 =	0032			
3 X 088 =	0264			
4 X 063 =	0252			
5 X 057 =	0285			
9	003			
NO ANS	004			
TOTALS	0225	00834	ANS	03.70

ON-THE-JOB TRAINING

0	001			
1 X 000 =	0000			
2 X 001 =	0002			
3 X 025 =	0075			
4 X 055 =	0220			
5 X 148 =	0740			
9	002			
NO ANS	003			
TOTALS	0229	01037	ANS	04.52

SIMULATORS

0	021			
1 X 011 =	0011			
2 X 015 =	0030			
3 X 059 =	0177			
4 X 045 =	0180			
5 X 066 =	0330			
9	012			
NO ANS	006			
TOTALS	0196	00728	ANS	03.71

TEXTS/MANUALS/AUDIO-VISUAL

0	002			
1 X 008 =	0008			
2 X 023 =	0046			
3 X 131 =	0393			
4 X 040 =	0160			
5 X 022 =	0110			
9	005			
NO ANS	004			
TOTALS	0224	00717	ANS	03.20

TABLE D2-83. (Continued)
NAVIGATION / ELECTRONIC

TRAINING TEAMS/STD'S

0	018			
1 X 025 = 0025				
2 X 023 = 0046				
3 X 087 = 0261				
4 X 047 = 0188				
5 X 022 = 0110				
9	007			
NO ANS	006			
TOTALS	0204	00630	ANS	03.08

TRAINING AVAILABILITY

0	043			
1 X 030 = 0030				
2 X 034 = 0068				
3 X 072 = 0216				
4 X 025 = 0100				
5 X 004 = 0020				
9	018			
NO ANS	009			
TOTALS	0165	00434	ANS	02.63

REFRESHER TRAINING

0	034			
1 X 019 = 0019				
2 X 026 = 0052				
3 X 060 = 0180				
4 X 051 = 0204				
5 X 028 = 0140				
9	012			
NO ANS	005			
TOTALS	0184	00595	ANS	03.23

FLEET EXERCISES

0	049			
1 X 027 = 0027				
2 X 023 = 0046				
3 X 059 = 0177				
4 X 025 = 0100				
5 X 014 = 0070				
9	027			
NO ANS	011			
TOTALS	0148	00420	ANS	02.83

TABLE D2-84.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
- 0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
- 1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
- 2=BELOW NORM. SIG. 9=NOT RELEVANT
- 3=NORMAL SIG.

NAVIGATION / FOG

CLASSROOM (FORMAL, INDIVIDUAL)

0	004			
1 X 027 = 0027				
2 X 040 = 0080				
3 X 109 = 0327				
4 X 024 = 0096				
5 X 024 = 0120				
9	002			
NO ANS	005			
TOTALS	0224	00650	ANS	02.90

ON-THE-JOB TRAINING

0	002			
1 X 001 = 0001				
2 X 003 = 0006				
3 X 019 = 0057				
4 X 039 = 0156				
5 X 168 = 0840				
9	000			
NO ANS	003			
TOTALS	0230	01060	ANS	04.60

SIMULATORS

0	006			
1 X 013 = 0013				
2 X 007 = 0014				
3 X 032 = 0096				
4 X 068 = 0272				
5 X 096 = 0480				
9	007			
NO ANS	006			
TOTALS	0216	00875	ANS	04.05

TEXTS/MANUALS/AUDIO-VISUAL

0	010			
1 X 022 = 0022				
2 X 043 = 0086				
3 X 118 = 0354				
4 X 018 = 0072				
5 X 014 = 0070				
9	005			
NO ANS	005			
TOTALS	0215	00604	ANS	02.80

TABLE D2-84. (Continued)
NAVIGATION / FOG

TRAINING TEAMS/STD'S

0	006				
1 X 006 = 0006					
2 X 009 = 0018					
3 X 061 = 0183					
4 X 091 = 0364					
5 X 056 = 0280					
9	001				
NO ANS	005				
TOTALS	0223	00851	ANS	03.81	

TRAINING AVAILABILITY

0	035			
1 X 022 = 0022				
2 X 024 = 0048				
3 X 074 = 0222				
4 X 038 = 0152				
5 X 017 = 0085				
9	015			
NO ANS	010			
TOTALS	0175	00529	ANS	03.02

REFRESHER TRAINING

0	009			
1 X 005 = 0005				
2 X 010 = 0020				
3 X 042 = 0126				
4 X 063 = 0252				
5 X 097 = 0485				
9	004			
NO ANS	005			
TOTALS	0217	00888	ANS	04.09

FLEET EXERCISES

0	050			
1 X 026 = 0026				
2 X 021 = 0042				
3 X 060 = 0180				
4 X 016 = 0064				
5 X 013 = 0065				
9	035			
NO ANS	014			
TOTALS	0136	00377	ANS	02.77

TABLE D2-85.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

DECK / ANCHORING

CLASSROOM (FORMAL, INDIVIDUAL)

0	021			
1 X 049 = 0049				
2 X 052 = 0104				
3 X 089 = 0267				
4 X 011 = 0044				
5 X 005 = 0025				
9	003			
NO ANS	005			
TOTALS	0206	00489	ANS	02.37

ON-THE-JOB TRAINING

0	001			
1 X 000 = 0000				
2 X 000 = 0000				
3 X 008 = 0024				
4 X 043 = 0172				
5 X 179 = 0895				
9	001			
NO ANS	003			
TOTALS	0230	01091	ANS	04.74

SIMULATORS

0	054			
1 X 037 = 0037				
2 X 017 = 0034				
3 X 033 = 0099				
4 X 019 = 0076				
5 X 011 = 0055				
9	051			
NO ANS	013			
TOTALS	0117	00301	ANS	02.57

TEXTS/MANUALS/AUDIO-VISUAL

0	013			
1 X 028 = 0028				
2 X 051 = 0102				
3 X 113 = 0339				
4 X 011 = 0044				
5 X 012 = 0060				
9	002			
NO ANS	005			
TOTALS	0215	00573	ANS	02.66

TABLE D2-85. (Continued)
DECK / ANCHORING

TRAINING TEAMS/STD'S

0	029			
1 X 040 =	0040			
2 X 039 =	0078			
3 X 064 =	0192			
4 X 026 =	0104			
5 X 010 =	0050			
9	017			
NO ANS	010			
TOTALS	0179	00464	ANS	02.59

TRAINING AVAILABILITY

0	052			
1 X 038 =	0038			
2 X 026 =	0052			
3 X 046 =	0138			
4 X 024 =	0096			
5 X 014 =	0070			
9	023			
NO ANS	012			
TOTALS	0148	00394	ANS	02.66

REFRESHER TRAINING

0	011			
1 X 010 =	0010			
2 X 008 =	0016			
3 X 057 =	0171			
4 X 062 =	0248			
5 X 078 =	0390			
9	005			
NO ANS	004			
TOTALS	0215	00835	ANS	03.88

FLEET EXERCISES

0	064			
1 X 039 =	0039			
2 X 025 =	0050			
3 X 030 =	0090			
4 X 008 =	0032			
5 X 007 =	0035			
9	047			
NO ANS	015			
TOTALS	0109	00246	ANS	02.25

TABLE D2-86.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

DECK / DOCKING

CLASSROOM (FORMAL, INDIVIDUAL)

	0	015		
	1 X	037 = 0037		
	2 X	062 = 0124		
	3 X	092 = 0276		
	4 X	015 = 0060		
	5 X	007 = 0035		
	9	002		
NO ANS		005		
TOTALS		0213	00532	ANS 02.49

ON-THE-JOB TRAINING

	0	001		
	1 X	000 = 0000		
	2 X	000 = 0000		
	3 X	001 = 0003		
	4 X	020 = 0080		
	5 X	209 = 1045		
	9	001		
NO ANS		003		
TOTALS		0230	01128	ANS 04.90

SIMULATORS

	0	033		
	1 X	031 = 0031		
	2 X	020 = 0040		
	3 X	041 = 0123		
	4 X	051 = 0204		
	5 X	024 = 0120		
	9	026		
NO ANS		009		
TOTALS		0167	00518	ANS 03.10

TEXTS/MANUALS/AUDIO-VISUAL

	0	011		
	1 X	030 = 0030		
	2 X	062 = 0124		
	3 X	103 = 0309		
	4 X	014 = 0056		
	5 X	009 = 0045		
	9	002		
NO ANS		004		
TOTALS		0218	00564	ANS 02.58

TABLE D2-86. (Continued)
DECK / DOCKING

TRAINING TEAMS/STD'S

0	051			
1 X 041 = 0041				
2 X 049 = 0098				
3 X 040 = 0120				
4 X 012 = 0048				
5 X 006 = 0030				
9	028			
NO ANS	008			
TOTALS	0148	00337	ANS	02.27

TRAINING AVAILABILITY

0	055			
1 X 038 = 0038				
2 X 026 = 0052				
3 X 045 = 0135				
4 X 020 = 0080				
5 X 013 = 0065				
9	028			
NO ANS	010			
TOTALS	0142	00370	ANS	02.60

REFRESHER TRAINING

0	023			
1 X 023 = 0023				
2 X 025 = 0050				
3 X 046 = 0138				
4 X 054 = 0216				
5 X 051 = 0255				
9	007			
NO ANS	006			
TOTALS	0199	00682	ANS	03.42

FLEET EXERCISES

0	061			
1 X 047 = 0047				
2 X 023 = 0046				
3 X 033 = 0099				
4 X 005 = 0020				
5 X 009 = 0045				
9	043			
NO ANS	014			
TOTALS	0117	00257	ANS	02.19

TABLE D2-87

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

DECK / BOAT LOWERING

CLASSROOM (FORMAL, INDIVIDUAL)

0	013			
1 X	042 =	0042		
2 X	068 =	0136		
3 X	087 =	0261		
4 X	014 =	0056		
5 X	004 =	0020		
9	002			
NO ANS	005			
TOTALS	0215	00515	ANS	02.39

ON-THE-JOB TRAINING

0	001			
1 X	000 =	0000		
2 X	000 =	0000		
3 X	001 =	0003		
4 X	024 =	0096		
5 X	205 =	1025		
9	001			
NO ANS	003			
TOTALS	0230	01124	ANS	04.88

SIMULATORS

0	059			
1 X	033 =	0033		
2 X	020 =	0040		
3 X	033 =	0099		
4 X	021 =	0084		
5 X	009 =	0045		
9	048			
NO ANS	012			
TOTALS	0116	00301	ANS	02.59

TEXTS/MANUALS/AUDIO-VISUAL

0	015			
1 X	034 =	0034		
2 X	057 =	0114		
3 X	100 =	0300		
4 X	016 =	0064		
5 X	007 =	0035		
9	002			
NO ANS	004			
TOTALS	0214	00547	ANS	02.55

TABLE D2-87. (Continued)
DECK / BOAT LOWERING

TRAINING TEAMS/STD'S				
0	048			
1 X 033 = 0033				
2 X 034 = 0068				
3 X 059 = 0177				
4 X 023 = 0092				
5 X 009 = 0045				
9	021			
NO ANS	008			
TOTALS	0158	00415	ANS	02.62
TRAINING AVAILABILITY				
0	055			
1 X 024 = 0024				
2 X 031 = 0062				
3 X 054 = 0162				
4 X 016 = 0064				
5 X 012 = 0060				
9	032			
NO ANS	011			
TOTALS	0137	00372	ANS	02.71
REFRESHER TRAINING				
0	031			
1 X 031 = 0031				
2 X 033 = 0066				
3 X 064 = 0192				
4 X 032 = 0128				
5 X 026 = 0130				
9	012			
NO ANS	006			
TOTALS	0186	00547	ANS	02.94
FLEET EXERCISES				
0	070			
1 X 038 = 0038				
2 X 023 = 0046				
3 X 035 = 0105				
4 X 003 = 0012				
5 X 007 = 0035				
9	045			
NO ANS	014			
TOTALS	0106	00236	ANS	02.22

TABLE D2-88.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

DECK / BOAT HANDLING

CLASSROOM (FORMAL, INDIVIDUAL)

0	013			
1 X 038 = 0038				
2 X 056 = 0112				
3 X 099 = 0297				
4 X 018 = 0072				
5 X 004 = 0020				
9	002			
NO ANS	005			
TOTALS	0215	00539	ANS	02.50

ON-THE-JOB TRAINING

0	001			
1 X 000 = 0000				
2 X 000 = 0000				
3 X 000 = 0000				
4 X 014 = 0056				
5 X 216 = 1080				
9	001			
NO ANS	003			
TOTALS	0230	01136	ANS	04.93

SIMULATORS

0	058			
1 X 032 = 0032				
2 X 024 = 0048				
3 X 031 = 0093				
4 X 021 = 0084				
5 X 011 = 0055				
9	047			
NO ANS	011			
TOTALS	0119	00312	ANS	02.62

TEXTS/MANUALS/AUDIO-VISUAL

0	012			
1 X 032 = 0032				
2 X 055 = 0110				
3 X 105 = 0315				
4 X 017 = 0068				
5 X 008 = 0040				
9	002			
NO ANS	004			
TOTALS	0217	00565	ANS	02.60

TABLE D2-88. (Continued)
DECK / BOAT HANDLING

TRAINING TEAMS/STD'S

0	041			
1 X 040 =	0040			
2 X 038 =	0076			
3 X 050 =	0150			
4 X 028 =	0112			
5 X 006 =	0030			
9	024			
NO ANS	008			
TOTALS	0162	00408	ANS	02.51

TRAINING AVAILABILITY

0	053			
1 X 024 =	0024			
2 X 036 =	0072			
3 X 051 =	0153			
4 X 020 =	0080			
5 X 013 =	0065			
9	027			
NO ANS	011			
TOTALS	0144	00394	ANS	02.73

REFRESHER TRAINING

0	044			
1 X 036 =	0036			
2 X 030 =	0060			
3 X 055 =	0165			
4 X 021 =	0084			
5 X 022 =	0110			
9	019			
NO ANS	008			
TOTALS	0164	00455	ANS	02.77

FLEET EXERCISES

0	073			
1 X 037 =	0037			
2 X 021 =	0042			
3 X 033 =	0099			
4 X 007 =	0028			
5 X 006 =	0030			
9	044			
NO ANS	014			
TOTALS	0104	00236	ANS	02.26

TABLE D2-89.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

DECK / TOWING

CLASSROOM (FORMAL, INDIVIDUAL)

0		013				
1	X	028	=	0028		
2	X	050	=	0100		
3	X	109	=	0327		
4	X	022	=	0088		
5	X	006	=	0030		
9		002				
NO ANS		005				
TOTALS		0215		00573	ANS	02.66

ON-THE-JOB TRAINING

0		001				
1	X	001	=	0001		
2	X	000	=	0000		
3	X	006	=	0018		
4	X	038	=	0152		
5	X	185	=	0925		
9		001				
NO ANS		003				
TOTALS		0230		01096	ANS	04.76

SIMULATORS

0		071				
1	X	039	=	0039		
2	X	023	=	0046		
3	X	024	=	0072		
4	X	012	=	0048		
5	X	005	=	0025		
9		049				
NO ANS		012				
TOTALS		0103		00230	ANS	02.23

TEXTS/MANUALS/AUDIO-VISUAL

0		009				
1	X	023	=	0023		
2	X	043	=	0086		
3	X	119	=	0357		
4	X	026	=	0104		
5	X	009	=	0045		
9		002				
NO ANS		004				
TOTALS		0220		00615	ANS	02.79

TABLE D2-89. (Continued)
DECK / TOWING

TRAINING TEAMS/STD'S

0	040			
1 X 030 = 0030				
2 X 032 = 0064				
3 X 060 = 0180				
4 X 036 = 0144				
5 X 010 = 0050				
9	021			
NO ANS	006			
TOTALS	0168	00468	ANS	02.78

TRAINING AVAILABILITY

0	058			
1 X 027 = 0027				
2 X 030 = 0060				
3 X 053 = 0159				
4 X 021 = 0084				
5 X 013 = 0065				
9	023			
NO ANS	010			
TOTALS	0144	00395	ANS	02.74

REFRESHER TRAINING

0	009			
1 X 012 = 0012				
2 X 008 = 0016				
3 X 046 = 0138				
4 X 075 = 0300				
5 X 078 = 0390				
9	003			
NO ANS	004			
TOTALS	0219	00856	ANS	03.90

FLEET EXERCISES

0	060			
1 X 022 = 0022				
2 X 021 = 0042				
3 X 043 = 0129				
4 X 024 = 0096				
5 X 022 = 0110				
9	031			
NO ANS	012			
TOTALS	0132	00399	ANS	03.02

TABLE D2-90.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

DECK / HELO DECK OPS

CLASSROOM (FORMAL, INDIVIDUAL)

0	009		
1 X 024 = 0024			
2 X 037 = 0074			
3 X 109 = 0327			
4 X 022 = 0088			
5 X 010 = 0050			
9	008		
NO ANS	016		
TOTALS	0202	00563	ANS 02.78

ON-THE-JOB TRAINING

0	001		
1 X 000 = 0000			
2 X 001 = 0002			
3 X 010 = 0030			
4 X 032 = 0128			
5 X 169 = 0845			
9	007		
NO ANS	015		
TOTALS	0212	01005	ANS 04.74

SIMULATORS

0	045		
1 X 038 = 0038			
2 X 016 = 0032			
3 X 028 = 0084			
4 X 022 = 0088			
5 X 014 = 0070			
9	051		
NO ANS	021		
TOTALS	0118	00312	ANS 02.64

TEXTS/MANUALS/AUDIO-VISUAL

0	011		
1 X 019 = 0019			
2 X 031 = 0062			
3 X 108 = 0324			
4 X 026 = 0104			
5 X 013 = 0065			
9	010		
NO ANS	017		
TOTALS	0197	00574	ANS 02.91

TABLE D2-90. (Continued)
DECK / HELO DECK OPS

TRAINING TEAMS/STD!S

0	019				
1 X	025	= 0025			
2 X	022	= 0044			
3 X	054	= 0162			
4 X	057	= 0228			
5 X	023	= 0115			
9	018				
NO ANS	017				
TOTALS	0181	00574		ANS	03.17

TRAINING AVAILABILITY

0	046				
1 X	017	= 0017			
2 X	023	= 0046			
3 X	053	= 0159			
4 X	033	= 0132			
5 X	018	= 0090			
9	026				
NO ANS	019				
TOTALS	0144	00444		ANS	03.08

REFRESHER TRAINING

0	031				
1 X	018	= 0018			
2 X	014	= 0028			
3 X	052	= 0156			
4 X	050	= 0200			
5 X	028	= 0140			
9	024				
NO ANS	018				
TOTALS	0162	00542		ANS	03.34

FLEET EXERCISES

0	041				
1 X	022	= 0022			
2 X	013	= 0026			
3 X	053	= 0159			
4 X	034	= 0136			
5 X	018	= 0090			
9	032				
NO ANS	022				
TOTALS	0140	00433		ANS	03.09

TABLE D2-91.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

GUNNERY / SPOTTING

CLASSROOM (FORMAL, INDIVIDUAL)

0	007			
1 X	019 =	0019		
2 X	022 =	0044		
3 X	101 =	0303		
4 X	042 =	0168		
5 X	019 =	0095		
9	008			
NO ANS	017			
TOTALS	0203	00629	ANS	03.09

ON-THE-JOB TRAINING

0	002			
1 X	002 =	0002		
2 X	006 =	0012		
3 X	032 =	0096		
4 X	053 =	0212		
5 X	117 =	0585		
9	007			
NO ANS	016			
TOTALS	0210	00907	ANS	04.31

SIMULATORS

0	029			
1 X	014 =	0014		
2 X	024 =	0048		
3 X	042 =	0126		
4 X	037 =	0148		
5 X	039 =	0195		
9	029			
NO ANS	021			
TOTALS	0156	00531	ANS	03.40

TEXTS/MANUALS/AUDIO-VISUAL

0	008			
1 X	015 =	0015		
2 X	037 =	0074		
3 X	114 =	0342		
4 X	027 =	0108		
5 X	010 =	0050		
9	008			
NO ANS	016			
TOTALS	0203	00589	ANS	02.90

TABLE D2-91. (Continued)
GUNNERY / SPOTTING

TRAINING TEAMS/STD'S

0	034				
1 X 020 = 0020					
2 X 032 = 0064					
3 X 062 = 0186					
4 X 033 = 0132					
5 X 015 = 0075					
9	021				
NO ANS	018				
TOTALS	0162	00477	ANS	02.94	

TRAINING AVAILABILITY

0	040			
1 X 014 = 0014				
2 X 031 = 0062				
3 X 060 = 0180				
4 X 035 = 0140				
5 X 019 = 0095				
9	017			
NO ANS	019			
TOTALS	0159	00491	ANS	03.08

REFRESHER TRAINING

0	004			
1 X 002 = 0002				
2 X 003 = 0006				
3 X 026 = 0078				
4 X 059 = 0236				
5 X 120 = 0600				
9	006			
NO ANS	015			
TOTALS	0210	00922	ANS	04.39

FLEET EXERCISES

0	027			
1 X 013 = 0013				
2 X 014 = 0028				
3 X 055 = 0165				
4 X 040 = 0160				
5 X 042 = 0210				
9	022			
NO ANS	022			
TOTALS	0164	00576	ANS	03.51

TABLE D2-92.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

GUNNERY / GUNMOUNT PROCEDURES

CLASSROOM (FORMAL, INDIVIDUAL)

0	003			
1 X	013 = 0013			
2 X	027 = 0054			
3 X	092 = 0276			
4 X	049 = 0196			
5 X	028 = 0140			
9	007			
NO ANS	016			
TOTALS	0209	00679	ANS	03.24

ON-THE-JOB TRAINING

0	001			
1 X	000 = 0000			
2 X	002 = 0004			
3 X	025 = 0075			
4 X	056 = 0224			
5 X	130 = 0650			
9	006			
NO ANS	015			
TOTALS	0213	00953	ANS	04.47

SIMULATORS

0	022			
1 X	008 = 0008			
2 X	011 = 0022			
3 X	042 = 0126			
4 X	055 = 0220			
5 X	060 = 0300			
9	017			
NO ANS	020			
TOTALS	0176	00676	ANS	03.84

TEXTS/MANUALS/AUDIO-VISUAL

0	008			
1 X	019 = 0019			
2 X	034 = 0068			
3 X	112 = 0336			
4 X	030 = 0120			
5 X	010 = 0050			
9	006			
NO ANS	016			
TOTALS	0205	00593	ANS	02.89

TABLE D2-92. (Continued)
GUNNERY / GUNMOUNT PROCEDURES

TRAINING TEAMS/STD'S

0	016			
1 X 015 = 0015				
2 X 018 = 0036				
3 X 074 = 0222				
4 X 055 = 0220				
5 X 020 = 0100				
9	020			
NO ANS	017			
TOTALS	0182	00593	ANS	03.25

TRAINING AVAILABILITY

0	028			
1 X 008 = 0008				
2 X 018 = 0036				
3 X 071 = 0213				
4 X 047 = 0188				
5 X 029 = 0145				
9	013			
NO ANS	021			
TOTALS	0173	00590	ANS	03.41

REFRESHER TRAINING

0	003			
1 X 003 = 0003				
2 X 000 = 0000				
3 X 027 = 0081				
4 X 055 = 0220				
5 X 128 = 0640				
9	006			
NO ANS	013			
TOTALS	0213	00944	ANS	04.43

FLEET EXERCISES

0	028			
1 X 012 = 0012				
2 X 016 = 0032				
3 X 060 = 0180				
4 X 036 = 0144				
5 X 039 = 0195				
9	022			
NO ANS	022			
TOTALS	0163	00563	ANS	03.45

TABLE D2-93.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

GUNNERY / FIRE CONTROL

CLASSROOM (FORMAL, INDIVIDUAL)

0	002			
1 X	009 =	0009		
2 X	025 =	0050		
3 X	090 =	0270		
4 X	059 =	0236		
5 X	026 =	0130		
9	007			
NO ANS	017			
TOTALS	0209	00695	ANS	03.32

ON-THE-JOB TRAINING

0	001			
1 X	001 =	0001		
2 X	005 =	0010		
3 X	029 =	0087		
4 X	060 =	0240		
5 X	117 =	0585		
9	006			
NO ANS	016			
TOTALS	0212	00923	ANS	04.35

SIMULATORS

0	017			
1 X	006 =	0006		
2 X	008 =	0016		
3 X	043 =	0129		
4 X	055 =	0220		
5 X	069 =	0345		
9	015			
NO ANS	022			
TOTALS	0181	00716	ANS	03.95

TEXTS/MANUALS/AUDIO-VISUAL

0	003			
1 X	012 =	0012		
2 X	036 =	0072		
3 X	119 =	0357		
4 X	028 =	0112		
5 X	015 =	0075		
9	006			
NO ANS	016			
TOTALS	0210	00628	ANS	02.99

TABLE D2-93. (Continued)
GUNNERY / FIRE CONTROL

TRAINING TEAMS/STD'S

0	019			
1 X 012 = 0012				
2 X 025 = 0050				
3 X 070 = 0210				
4 X 054 = 0216				
5 X 017 = 0085				
9	018			
NO ANS	020			
TOTALS	0178	00573	ANS	03.21

TRAINING AVAILABILITY

0	030			
1 X 013 = 0013				
2 X 022 = 0044				
3 X 072 = 0216				
4 X 044 = 0176				
5 X 023 = 0115				
9	012			
NO ANS	019			
TOTALS	0174	00564	ANS	03.24

REFRESHER TRAINING

0	004			
1 X 001 = 0001				
2 X 002 = 0004				
3 X 025 = 0075				
4 X 058 = 0232				
5 X 125 = 0625				
9	006			
NO ANS	014			
TOTALS	0211	00937	ANS	04.44

FLEET EXERCISES

0	021			
1 X 010 = 0010				
2 X 020 = 0040				
3 X 059 = 0177				
4 X 043 = 0172				
5 X 038 = 0190				
9	022			
NO ANS	022			
TOTALS	0170	00589	ANS	03.46

TABLE D2-94.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

GUNNERY / LIAISON

CLASSROOM (FORMAL, INDIVIDUAL)

0	007			
1 X	018 = 0018			
2 X	028 = 0056			
3 X	098 = 0294			
4 X	036 = 0144			
5 X	014 = 0070			
9	009			
NO ANS	025			
TOTALS	0194	00582	ANS	03.00

ON-THE-JOB TRAINING

0	003			
1 X	006 = 0006			
2 X	006 = 0012			
3 X	039 = 0117			
4 X	047 = 0188			
5 X	099 = 0495			
9	010			
NO ANS	025			
TOTALS	0197	00818	ANS	04.15

SIMULATORS

0	027			
1 X	011 = 0011			
2 X	019 = 0038			
3 X	050 = 0150			
4 X	040 = 0160			
5 X	031 = 0155			
9	028			
NO ANS	029			
TOTALS	0151	00514	ANS	03.40

TEXTS/MANUALS/AUDIO-VISUAL

0	008			
1 X	024 = 0024			
2 X	044 = 0088			
3 X	096 = 0288			
4 X	021 = 0084			
5 X	009 = 0045			
9	008			
NO ANS	025			
TOTALS	0194	00529	ANS	02.72

TABLE D2-94. (Continued)
GUNNERY / LIAISON

TRAINING TEAMS/STD'S

0	019			
1 X 019 = 0019				
2 X 023 = 0046				
3 X 077 = 0231				
4 X 030 = 0120				
5 X 016 = 0080				
9	024			
NO ANS	027			
TOTALS	0165	00496	ANS	03.00

TRAINING AVAILABILITY

0	026			
1 X 016 = 0016				
2 X 028 = 0056				
3 X 073 = 0219				
4 X 035 = 0140				
5 X 015 = 0075				
9	016			
NO ANS	026			
TOTALS	0167	00506	ANS	03.02

REFRESHER TRAINING

0	004			
1 X 002 = 0002				
2 X 003 = 0006				
3 X 030 = 0090				
4 X 066 = 0264				
5 X 095 = 0475				
9	011			
NO ANS	024			
TOTALS	0196	00837	ANS	04.27

FLEET EXERCISES

0	021			
1 X 010 = 0010				
2 X 016 = 0032				
3 X 055 = 0165				
4 X 041 = 0164				
5 X 041 = 0205				
9	023			
NO ANS	028			
TOTALS	0163	00576	ANS	03.53

TABLE D2-95.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

SHIP HANDLING / ANCHORING

CLASSROOM (FORMAL, INDIVIDUAL)

0	014			
1 X	031 =	0031		
2 X	045 =	0090		
3 X	113 =	0339		
4 X	020 =	0080		
5 X	007 =	0035		
9	001			
NO ANS	004			
TOTALS	0216	00575	ANS	02.66

ON-THE-JOB TRAINING

0	001			
1 X	000 =	0000		
2 X	000 =	0000		
3 X	010 =	0030		
4 X	038 =	0152		
5 X	181 =	0905		
9	001			
NO ANS	004			
TOTALS	0229	01087	ANS	04.74

SIMULATORS

0	045			
1 X	028 =	0028		
2 X	034 =	0068		
3 X	039 =	0117		
4 X	031 =	0124		
5 X	014 =	0070		
9	034			
NO ANS	010			
TOTALS	0146	00407	ANS	02.78

TEXTS/MANUALS/AUDIO-VISUAL

0	006			
1 X	018 =	0018		
2 X	049 =	0098		
3 X	125 =	0375		
4 X	019 =	0076		
5 X	009 =	0045		
9	004			
NO ANS	005			
TOTALS	0220	00612	ANS	02.78

TABLE D2-95. (Continued)
SHIP HANDLING / ANCHORING

TRAINING TEAMS/STD'S

0	027			
1 X 024 = 0024				
2 X 035 = 0070				
3 X 076 = 0228				
4 X 036 = 0144				
5 X 014 = 0070				
9	017			
NO ANS	006			
TOTALS	0185	00536	ANS	02.89

TRAINING AVAILABILITY

0	049			
1 X 021 = 0021				
2 X 028 = 0056				
3 X 061 = 0183				
4 X 026 = 0104				
5 X 019 = 0095				
9	020			
NO ANS	011			
TOTALS	0155	00459	ANS	02.96

REFRESHER TRAINING

0	007			
1 X 010 = 0010				
2 X 008 = 0016				
3 X 049 = 0147				
4 X 075 = 0300				
5 X 079 = 0395				
9	003			
NO ANS	004			
TOTALS	0221	00868	ANS	03.92

FLEET EXERCISES

0	054			
1 X 023 = 0023				
2 X 024 = 0048				
3 X 050 = 0150				
4 X 016 = 0064				
5 X 009 = 0045				
9	044			
NO ANS	015			
TOTALS	0122	00330	ANS	02.70

TABLE D2-96.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

SHIP HANDLING / DOCKING

CLASSROOM (FORMAL, INDIVIDUAL)

0	013			
1 X	032 = 0032			
2 X	050 = 0100			
3 X	108 = 0324			
4 X	018 = 0072			
5 X	009 = 0045			
9	001			
NO ANS	004			
TOTALS	0217	00573	ANS	02.64

ON-THE-JOB TRAINING

0	001			
1 X	000 = 0000			
2 X	001 = 0002			
3 X	000 = 0000			
4 X	020 = 0080			
5 X	208 = 1040			
9	001			
NO ANS	004			
TOTALS	0229	01122	ANS	04.89

SIMULATORS

0	032			
1 X	022 = 0022			
2 X	026 = 0052			
3 X	044 = 0132			
4 X	081 = 0204			
5 X	035 = 0175			
9	017			
NO ANS	008			
TOTALS	0178	00585	ANS	03.28

TEXTS/MANUALS/AUDIO VISUAL

0	009			
1 X	002 = 0022			
2 X	048 = 0096			
3 X	124 = 0372			
4 X	014 = 0056			
5 X	010 = 0050			
9	003			
NO ANS	005			
TOTALS	0218	00596	ANS	02.73

TABLE D2-96. (Continued)
SHIP HANDLING / DOCKING

TRAINING TEAMS/STD'S

0	049			
1 X 031 = 0031				
2 X 037 = 0074				
3 X 055 = 0165				
4 X 027 = 0108				
5 X 005 = 0025				
9	025			
NO ANS	006			
TOTALS	0155	00403	ANS	02.60

TRAINING AVAILABILITY

0	048			
1 X 029 = 0029				
2 X 030 = 0060				
3 X 051 = 0153				
4 X 024 = 0096				
5 X 024 = 0120				
9	018			
NO ANS	011			
TOTALS	0158	00458	ANS	02.89

REFRESHER TRAINING

0	018			
1 X 012 = 0012				
2 X 017 = 0034				
3 X 059 = 0177				
4 X 053 = 0212				
5 X 064 = 0320				
9	006			
NO ANS	006			
TOTALS	0205	00755	ANS	03.68

FLEET EXERCISES

0	061			
1 X 025 = 0025				
2 X 023 = 0046				
3 X 049 = 0147				
4 X 010 = 0040				
5 X 010 = 0050				
9	043			
NO ANS	014			
TOTALS	0117	00308	ANS	02.63

TABLE D2-97.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

SHIP HANDLINGG / COLLISION AVOIDANCE

CLASSROOM (FORMAL, INDIVIDUAL)

0	013			
1 X 028 = 0028				
2 X 050 = 0100				
3 X 109 = 0327				
4 X 022 = 0088				
5 X 006 = 0030				
9	002			
NO ANS	005			
TOTALS	0215	00573	ANS	02.66

ON-THE-JOB TRAINING

0	001			
1 X 001 = 0001				
2 X 000 = 0000				
3 X 006 = 0018				
4 X 038 = 0152				
5 X 185 = 0925				
9	001			
NO ANS	003			
TOTALS	0230	01096	ANS	04.76

SIMULATORS

0	071			
1 X 039 = 0039				
2 X 023 = 0046				
3 X 024 = 0072				
4 X 012 = 0048				
5 X 005 = 0025				
9	049			
NO ANS	012			
TOTALS	0103	00230	ANS	02.23

TEXTS/MANUALS/AUDIO-VISUAL

0	009			
1 X 023 = 0023				
2 X 043 = 0086				
3 X 119 = 0357				
4 X 026 = 0104				
5 X 009 = 0045				
9	002			
NO ANS	004			
TOTALS	0220	00615	ANS	02.79

TABLE D2-97. (Continued)
SHIP HANDLING / COLLISION AVOIDANCE

TRAINING TEAMS/STD'S

0	040		
1 X 030 = 0030			
2 X 032 = 0064			
3 X 060 = 0180			
4 X 036 = 0144			
5 X 010 = 0050			
9	021		
NO ANS	006		
TOTALS	0168	00468	ANS 02.78

TRAINING AVAILABILITY

0	058		
1 X 027 = 0027			
2 X 030 = 0060			
3 X 053 = 0159			
4 X 021 = 0084			
5 X 013 = 0065			
9	023		
NO ANS	010		
TOTALS	0144	00395	ANS 02.74

REFRESHER TRAINING

0	009		
1 X 012 = 0012			
2 X 008 = 0016			
3 X 046 = 0138			
4 X 075 = 0300			
5 X 078 = 0390			
9	003		
NO ANS	004		
TOTALS	0219	00856	ANS 03.90

FLEET EXERCISES

0	060		
1 X 022 = 0022			
2 X 021 = 0042			
3 X 043 = 0129			
4 X 024 = 0096			
5 X 022 = 0110			
9	031		
NO ANS	012		
TOTALS	0132	00399	ANS 03.02

TABLE D2-98.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

SHIP HANDLING / RULES OF THE ROAD

CLASSROOM (FORMAL, INDIVIDUAL)

0	009			
1 X 024 =	0024			
2 X 037 =	0074			
3 X 109 =	0327			
4 X 022 =	0088			
5 X 010 =	0050			
9	008			
NO ANS	016			
TOTALS	0202	00563	ANS	02.78

ON-THE-JOB TRAINING

0	001			
1 X 000 =	0000			
2 X 001 =	0002			
3 X 010 =	0030			
4 X 032 =	0128			
5 X 169 =	0845			
9	007			
NO ANS	015			
TOTALS	0212	01005	ANS	04.74

SIMULATORS

0	045			
1 X 038 =	0038			
2 X 016 =	0032			
3 X 028 =	0084			
4 X 022 =	0088			
5 X 014 =	0070			
9	051			
NO ANS	021			
TOTALS	0118	00312	ANS	02.64

TEXTS/MANUALS/AUDIO-VISUAL

0	011			
1 X 019 =	0019			
2 X 031 =	0062			
3 X 108 =	0324			
4 X 026 =	0104			
5 X 013 =	0065			
9	010			
NO ANS	017			
TOTALS	0197	00574	ANS	02.91

TABLE D2-98. (Continued)
SHIP HANDLING / RULES OF THE ROAD

TRAINING TEAMS/STD'S

0	019			
1 X 025 = 0025				
2 X 022 = 0044				
3 X 054 = 0162				
4 X 057 = 0228				
5 X 023 = 0115				
9	018			
NO ANS	017			
TOTALS	0181	00574	ANS	03.17

TRAINING AVAILABILITY

0	046			
1 X 017 = 0017				
2 X 023 = 0046				
3 X 053 = 0159				
4 X 033 = 0132				
5 X 018 = 0090				
9	026			
NO ANS	019			
TOTALS	0144	00444	ANS	03.08

REFRESHER TRAINING

0	031			
1 X 018 = 0018				
2 X 014 = 0028				
3 X 052 = 0156				
4 X 050 = 0200				
5 X 028 = 0140				
9	024			
NO ANS	018			
TOTALS	0162	00542	ANS	03.34

FLEET EXERCISES

0	041			
1 X 022 = 0022				
2 X 013 = 0026				
3 X 053 = 0159				
4 X 034 = 0136				
5 X 018 = 0090				
9	032			
NO ANS	022			
TOTALS	0140	00433	ANS	03.09

TABLE D2-99.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

SHIP HANDLING / ICE BREAKING

CLASSROOM (FORMAL, INDIVIDUAL)

0	007				
1 X	019 =	0019			
2 X	022 =	0044			
3 X	101 =	0303			
4 X	042 =	0168			
5 X	019 =	0095			
9	008				
NO ANS	017				
TOTALS	0203		00629	ANS	03.09

ON-THE-JOB TRAINING

0	002				
1 X	002 =	0002			
2 X	006 =	0012			
3 X	032 =	0096			
4 X	053 =	0212			
5 X	117 =	0585			
9	007				
NO ANS	016				
TOTALS	0210		00907	ANS	04.31

SIMULATORS

0	029				
1 X	014 =	0014			
2 X	024 =	0048			
3 X	042 =	0126			
4 X	037 =	0148			
5 X	039 =	0195			
9	029				
NO ANS	021				
TOTALS	0156		00531	ANS	03.40

TEXTS/MANUALS/AUDIO-VISUAL

0	008				
1 X	015 =	0015			
2 X	037 =	0074			
3 X	114 =	0342			
4 X	027 =	0108			
5 X	010 =	0050			
9	008				
NO ANS	016				
TOTALS	0203		00589	ANS	02.90

TABLE D2-99. (Continued)
SHIP HANDLING / ICE BREAKING

TRAINING TEAMS/STD'S

0	034			
1 X 020 = 0020				
2 X 032 = 0064				
3 X 062 = 0186				
4 X 033 = 0132				
5 X 015 = 0075				
9	021			
NO ANS	018			
TOTALS	0162	00477	ANS	02.94

TRAINING AVAILABILITY

0	040			
1 X 014 = 0014				
2 X 031 = 0062				
3 X 060 = 0180				
4 X 035 = 0140				
5 X 019 = 0095				
9	017			
NO ANS	019			
TOTALS	0159	00491	ANS	03.08

REFRESHER TRAINING

0	004			
1 X 002 = 0002				
2 X 003 = 0006				
3 X 026 = 0078				
4 X 059 = 0236				
5 X 120 = 0600				
9	006			
NO ANS	015			
TOTALS	0210	00922	ANS	04.39

FLEET EXERCISES

0	027			
1 X 013 = 0013				
2 X 014 = 0028				
3 X 055 = 0165				
4 X 040 = 0160				
5 X 042 = 0210				
9	022			
NO ANS	022			
TOTALS	0164	00576	ANS	03.51

TABLE D2-100.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT   4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE   5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.   9=NOT RELEVANT
3=NORMAL SIG.

SHIP HANDLING / HEAVY WEATHER

CLASSROOM (FORMAL, INDIVIDUAL)

0	003			
1 X 013 = 0013				
2 X 027 = 0054				
3 X 092 = 0276				
4 X 049 = 0196				
5 X 028 = 0140				
9	007			
NO ANS	016			
TOTALS	0209	00679	ANS	03.24

ON-THE-JOB TRAINING

0	001			
1 X 000 = 0000				
2 X 002 = 0004				
3 X 025 = 0075				
4 X 056 = 0224				
5 X 130 = 0650				
9	006			
NO ANS	015			
TOTALS	0213	00953	ANS	04.47

SIMULATORS

0	022			
1 X 008 = 0008				
2 X 011 = 0022				
3 X 042 = 0126				
4 X 055 = 0220				
5 X 060 = 0300				
9	017			
NO ANS	020			
TOTALS	0176	00676	ANS	03.84

TEXTS/MANUALS/AUDIO-VISUAL

0	008			
1 X 019 = 0019				
2 X 034 = 0068				
3 X 112 = 0336				
4 X 030 = 0120				
5 X 010 = 0050				
9	006			
NO ANS	016			
TOTALS	0205	00593	ANS	02.89

TABLE D2-100. (Continued)
SHIP HANDLING / HEAVY WEATHER

TRAINING TEAMS/STD'S

0	016			
1 X 015 = 0015				
2 X 018 = 0036				
3 X 074 = 0222				
4 X 055 = 0220				
5 X 020 = 0100				
9	020			
NO ANS	017			
TOTALS	0182	00593	ANS	03.25

TRAINING AVAILABILITY

0	028			
1 X 008 = 0008				
2 X 018 = 0036				
3 X 071 = 0213				
4 X 047 = 0188				
5 X 029 = 0145				
9	013			
NO ANS	021			
TOTALS	0173	00590	ANS	03.41

REFRESHER TRAINING

0	003			
1 X 003 = 0003				
2 X 000 = 0000				
3 X 027 = 0081				
4 X 055 = 0220				
5 X 128 = 0640				
9	006			
NO ANS	013			
TOTALS	0213	00944	ANS	04.43

FLEET EXERCISES

0	028			
1 X 012 = 0012				
2 X 016 = 0032				
3 X 060 = 0180				
4 X 036 = 0144				
5 X 039 = 0195				
9	022			
NO ANS	022			
TOTALS	0163	00563	ANS	03.45

TABLE D2-101.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

CIC / ANTI-AIR (AAW)

CLASSROOM (FORMAL, INDIVIDUAL)

0	002			
1 X 009 = 0009				
2 X 025 = 0050				
3 X 090 = 0270				
4 X 059 = 0236				
5 X 026 = 0130				
9	007			
NO ANS	017			
TOTALS	0209	00695	ANS	03.32

ON-THE-JOB TRAINING

0	001			
1 X 001 = 0001				
2 X 005 = 0010				
3 X 029 = 0087				
4 X 060 = 0240				
5 X 117 = 0585				
9	006			
NO ANS	016			
TOTALS	0212	00923	ANS	04.35

SIMULATORS

0	017			
1 X 006 = 0006				
2 X 008 = 0016				
3 X 043 = 0129				
4 X 055 = 0220				
5 X 069 = 0345				
9	015			
NO ANS	022			
TOTALS	0181	00716	ANS	03.95

TEXTS/MANUALS/AUDIO-VISUAL

0	003			
1 X 012 = 0012				
2 X 036 = 0072				
3 X 119 = 0357				
4 X 028 = 0112				
5 X 015 = 0075				
9	006			
NO ANS	016			
TOTALS	0210	00628	ANS	02.99

TABLE D2-101. (Continued)
CIC / ANTI-AIR (AAW)

TRAINING TEAMS/STD'S

0	019			
1 X 012 =	0012			
2 X 025 =	0050			
3 X 070 =	0210			
4 X 054 =	0216			
5 X 017 =	0085			
9	018			
NO ANS	020			
TOTALS	0178	00573	ANS	03.21

TRAINING AVAILABILITY

0	030			
1 X 013 =	0013			
2 X 022 =	0044			
3 X 072 =	0216			
4 X 044 =	0176			
5 X 023 =	0115			
9	012			
NO ANS	019			
TOTALS	0174	00564	ANS	03.24

REFRESHER TRAINING

0	004			
1 X 001 =	0001			
2 X 002 =	0004			
3 X 025 =	0075			
4 X 058 =	0232			
5 X 125 =	0625			
9	006			
NO ANS	014			
TOTALS	0211	00937	ANS	04.44

FLEET EXERCISES

0	021			
1 X 010 =	0010			
2 X 020 =	0040			
3 X 059 =	0177			
4 X 043 =	0172			
5 X 038 =	0190			
9	022			
NO ANS	022			
TOTALS	0170	00589	ANS	03.46

TABLE D2-102.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

CIC / ANTI-SURFACE

CLASSROOM (FORMAL, INDIVIDUAL)

0	007			
1 X 018 =	0018			
2 X 028 =	0056			
3 X 098 =	0294			
4 X 036 =	0144			
5 X 014 =	0070			
9	009			
NO ANS	025			
TOTALS	0194	00582	ANS	03.00

ON-THE-JOB TRAINING

0	003			
1 X 006 =	0006			
2 X 006 =	0012			
3 X 039 =	0117			
4 X 047 =	0188			
5 X 099 =	0495			
9	010			
NO ANS	025			
TOTALS	0197	00818	ANS	04.15

SIMULATORS

0	027			
1 X 011 =	0011			
2 X 019 =	0038			
3 X 050 =	0150			
4 X 040 =	0160			
5 X 031 =	0155			
9	028			
NO ANS	029			
TOTALS	0151	00514	ANS	03.40

TEXTS/MANUALS/AUDIO-VISUAL

0	008			
1 X 024 =	0024			
2 X 044 =	0088			
3 X 096 =	0288			
4 X 021 =	0084			
5 X 009 =	0045			
9	008			
NO ANS	025			
TOTALS	0194	00529	ANS	02.72

TABLE D2-102. (Continued)
CIC / ANTI-SURFACE

TRAINING TEAMS/STD'S

0	019			
1 X 019 = 0019				
2 X 023 = 0046				
3 X 077 = 0231				
4 X 030 = 0120				
5 X 016 = 0080				
9	024			
NO ANS	027			
TOTALS	0165	00496	ANS	03.00

TRAINING AVAILABILITY

0	026			
1 X 016 = 0016				
2 X 028 = 0056				
3 X 073 = 0219				
4 X 035 = 0140				
5 X 015 = 0075				
9	016			
NO ANS	026			
TOTALS	0167	00506	ANS	03.02

REFRESHER TRAINING

0	004			
1 X 002 = 0002				
2 X 003 = 0006				
3 X 030 = 0090				
4 X 066 = 0264				
5 X 095 = 0475				
9	011			
NO ANS	024			
TOTALS	0196	00837	ANS	04.27

FLEET EXERCISES

0	021			
1 X 010 = 0010				
2 X 016 = 0032				
3 X 055 = 0165				
4 X 041 = 0164				
5 X 041 = 0205				
9	023			
NO ANS	028			
TOTALS	0163	00576	ANS	03.53

TABLE D2-103.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH·SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

CIC / ANTI-SUBMARINE (ASW)

CLASSROOM (FORMAL, INDIVIDUAL)

0	014			
1 X 031 = 0031				
2 X 045 = 0090				
3 X 113 = 0339				
4 X 020 = 0080				
5 X 007 = 0035				
9	001			
NO ANS	004			
TOTALS	0216	00575	ANS	02.66

ON-THE-JOB TRAINING

0	001			
1 X 000 = 0000				
2 X 000 = 0000				
3 X 010 = 0030				
4 X 038 = 0152				
5 X 181 = 0905				
9	001			
NO ANS	004			
TOTALS	0229	01087	ANS	04.74

SIMULATORS

0	045			
1 X 028 = 0028				
2 X 034 = 0068				
3 X 039 = 0117				
4 X 031 = 0124				
5 X 014 = 0070				
9	034			
NO ANS	010			
TOTALS	0146	00407	ANS	02.78

TEXTS/MANUALS/AUDIO-VISUAL

0	006			
1 X 018 = 0018				
2 X 049 = 0098				
3 X 125 = 0375				
4 X 019 = 0076				
5 X 009 = 0045				
9	004			
NO ANS	005			
TOTALS	0220	00612	ANS	02.78

TABLE D2-103. (Continued)
CIC / ANTI-SUBMARINE (ASW)

TRAINING TEAMS/STD'S

0	027			
1 X	024 =	0024		
2 X	035 =	0070		
3 X	076 =	0228		
4 X	036 =	0144		
5 X	014 =	0070		
9	017			
NO ANS	006			
TOTALS	0185	00536	ANS	02.89

TRAINING AVAILABILITY

0	049			
1 X	021 =	0021		
2 X	028 =	0056		
3 X	061 =	0183		
4 X	026 =	0104		
5 X	019 =	0095		
9	020			
NO ANS	011			
TOTALS	0155	00459	ANS	02.96

REFRESHER TRAINING

0	007			
1 X	010 =	0010		
2 X	008 =	0016		
3 X	049 =	0147		
4 X	075 =	0300		
5 X	079 =	0395		
9	003			
NO ANS	004			
TOTALS	0221	00868	ANS	03.92

FLEET EXERCISES

0	054			
1 X	023 =	0023		
2 X	024 =	0048		
3 X	050 =	0150		
4 X	016 =	0064		
5 X	009 =	0045		
9	044			
NO ANS	015			
TOTALS	0122	00330	ANS	02.70

TABLE D2-104.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

CIC / FOG NAVIGATION

CLASSROOM (FORMAL, INDIVIDUAL)

```
     0    013
     1 X 032 = 0032
     2 X 050 = 0100
     3 X 108 = 0324
     4 X 018 = 0072
     5 X 009 = 0045
     9    001
NO ANS    004
TOTALS    0217    00573    ANS   02.64
```

ON-THE-JOB TRAINING

```
     0    001
     1 X 000 = 0000
     2 X 001 = 0002
     3 X 000 = 0000
     4 X 020 = 0080
     5 X 208 = 1040
     9    001
NO ANS    004
TOTALS    0229    01122    ANS   04.89
```

SIMULATORS

```
     0    032
     1 X 022 = 0022
     2 X 026 = 0052
     3 X 044 = 0132
     4 X 051 = 0204
     5 X 035 = 0175
     9    017
NO ANS    008
TOTALS    0178    00585    ANS   03.28
```

TEXTS/MANUALS/AUDIO-VISUAL

```
     0    009
     1 X 022 = 0022
     2 X 048 = 0096
     3 X 124 = 0372
     4 X 014 = 0056
     5 X 010 = 0050
     9    003
NO ANS    005
TOTALS    0218    00596    ANS   02.73
```

TABLE D2-104. (Continued)
CIC / FOG NAVIGATION

TRAINING TEAMS/STD'S

0	049			
1 X 031 = 0031				
2 X 037 = 0074				
3 X 055 = 0165				
4 X 027 = 0108				
5 X 005 = 0025				
9	025			
NO ANS	006			
TOTALS	0155	00403	ANS	02.60

TRAINING AVAILABILITY

0	048			
1 X 029 = 0029				
2 X 030 = 0060				
3 X 051 = 0153				
4 X 024 = 0096				
5 X 024 = 0120				
9	018			
NO ANS	011			
TOTALS	0158	00458	ANS	02.89

REFRESHER TRAINING

0	018			
1 X 012 = 0012				
2 X 017 = 0034				
3 X 059 = 0177				
4 X 053 = 0212				
5 X 064 = 0320				
9	006			
NO ANS	006			
TOTALS	0205	00755	ANS	03.68

FLEET EXERCISES

0	061			
1 X 025 = 0025				
2 X 023 = 0046				
3 X 049 = 0147				
4 X 010 = 0040				
5 X 010 = 0050				
9	043			
NO ANS	014			
TOTALS	0117	00308	ANS	02.63

TABLE D2-105.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:
0=NOT SIGNIFICANT 4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE 5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG. 9=NOT RELEVANT
3=NORMAL SIG.

CIC / COLLISION AVOIDANCE

CLASSROOM (FORMAL, INDIVIDUAL)

0	004			
1 X	008 =	0008		
2 X	020 =	0040		
3 X	097 =	0291		
4 X	057 =	0228		
5 X	044 =	0220		
9	001			
NO ANS	004			
TOTALS	0226	00787	ANS	03.48

ON-THE-JOB TRAINING

0	003			
1 X	006 =	0006		
2 X	014 =	0028		
3 X	059 =	0177		
4 X	049 =	0196		
5 X	094 =	0470		
9	004			
NO ANS	006			
TOTALS	0222	00877	ANS	03.95

SIMULATORS

0	007			
1 X	004 =	0004		
2 X	005 =	0010		
3 X	029 =	0087		
4 X	057 =	0228		
5 X	119 =	0595		
9	008			
NO ANS	006			
TOTALS	0214	00924	ANS	04.31

TEXTS/MANUALS/AUDIO-VISUAL

0	004			
1 X	011 =	0011		
2 X	029 =	0058		
3 X	114 =	0342		
4 X	046 =	0184		
5 X	025 =	0125		
9	001			
NO ANS	005			
TOTALS	0225	00720	ANS	03.20

TABLE D2-105. (Continued)
CIC / COLLISION AVOIDANCE

TRAINING TEAMS/STD'S

0	014			
1 X 015 = 0015				
2 X 034 = 0068				
3 X 078 = 0234				
4 X 044 = 0176				
5 X 033 = 0165				
9	011			
NO ANS	006			
TOTALS	0204	00658	ANS	03.22

TRAINING AVAILABILITY

0	037			
1 X 014 = 0014				
2 X 031 = 0062				
3 X 071 = 0213				
4 X 029 = 0116				
5 X 024 = 0120				
9	018			
NO ANS	011			
TOTALS	0169	00525	ANS	03.10

REFRESHER TRAINING

0	024			
1 X 014 = 0014				
2 X 033 = 0066				
3 X 069 = 0207				
4 X 045 = 0180				
5 X 034 = 0170				
9	010			
NO ANS	006			
TOTALS	0195	00637	ANS	03.26

FLEET EXERCISES

0	034			
1 X 015 = 0015				
2 X 014 = 0028				
3 X 055 = 0165				
4 X 045 = 0180				
5 X 041 = 0205				
9	019			
NO ANS	012			
TOTALS	0170	00593	ANS	03.48

TABLE D2-106.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

CIC / STATIONING

CLASSROOM (FORMAL, INDIVIDUAL)

0	003			
1 X 000 =	0000			
2 X 005 =	0010			
3 X 030 =	0090			
4 X 069 =	0276			
5 X 124 =	0620			
9	001			
NO ANS	003			
TOTALS	0228	00996	ANS	04.36

ON-THE-JOB TRAINING

0	003			
1 X 009 =	0009			
2 X 013 =	0026			
3 X 054 =	0162			
4 X 062 =	0248			
5 X 090 =	0450			
9	000			
NO ANS	004			
TOTALS	0228	00895	ANS	03.92

SIMULATORS

0	011			
1 X 005 =	0005			
2 X 015 =	0030			
3 X 047 =	0141			
4 X 062 =	0248			
5 X 079 =	0395			
9	007			
NO ANS	009			
TOTALS	0208	00819	ANS	03.93

TEXTS/MANUALS/AUDIO-VISUAL

0	002			
1 X 001 =	0001			
2 X 008 =	0016			
3 X 062 =	0186			
4 X 080 =	0320			
5 X 078 =	0390			
9	001			
NO ANS	003			
TOTALS	0229	00913	ANS	03.98

TABLE D2-106. (Continued)
CIC / STATIONING

TRAINING TEAMS/STD'S

0	010			
1 X	014 =	0014		
2 X	015 =	0030		
3 X	091 =	0273		
4 X	057 =	0228		
5 X	037 =	0185		
9	005			
NO ANS	006			
TOTALS	0214	00730	ANS	03.41

TRAINING AVAILABILITY

0	024			
1 X	013 =	0013		
2 X	018 =	0036		
3 X	087 =	0261		
4 X	041 =	0164		
5 X	029 =	0145		
9	012			
NO ANS	011			
TOTALS	0188	00619	ANS	03.29

REFRESHER TRAINING

0	018			
1 X	022 =	0022		
2 X	033 =	0066		
3 X	081 =	0243		
4 X	037 =	0148		
5 X	030 =	0150		
9	008			
NO ANS	006			
TOTALS	0203	00629	ANS	03.09

FLEET EXERCISES

0	031			
1 X	020 =	0020		
2 X	023 =	0046		
3 X	070 =	0210		
4 X	026 =	0104		
5 X	030 =	0150		
9	023			
NO ANS	012			
TOTALS	0169	00530	ANS	03.13

TABLE D2-107.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

CIC / SAR AIR CONTROL

CLASSROOM (FORMAL, INDIVIDUAL)

0	016		
1 X 026 = 0026			
2 X 045 = 0090			
3 X 092 = 0276			
4 X 021 = 0084			
5 X 012 = 0060			
9	008		
NO ANS	015		
TOTALS	0196	00536	ANS 02.73

ON-THE-JOB TRAINING

0	004		
1 X 000 = 0000			
2 X 000 = 0000			
3 X 008 = 0024			
4 X 020 = 0080			
5 X 182 = 0910			
9	008		
NO ANS	013		
TOTALS	0210	01014	ANS 04.82

SIMULATORS

0	065		
1 X 022 = 0022			
2 X 019 = 0038			
3 X 028 = 0084			
4 X 011 = 0044			
5 X 012 = 0060			
9	059		
NO ANS	019		
TOTALS	0092	00248	ANS 02.69

TEXTS/MANUALS/AUDIO-VISUAL

0	013		
1 X 011 = 0011			
2 X 033 = 0066			
3 X 111 = 0333			
4 X 026 = 0104			
5 X 018 = 0090			
9	010		
NO ANS	013		
TOTALS	0199	00604	ANS 03.03

TABLE D2-107. (Continued)
CIC / SAR AIR CONTROL

TRAINING TEAMS/STD'S

0	070			
1 X 032 = 0032				
2 X 026 = 0052				
3 X 031 = 0093				
4 X 004 = 0016				
5 X 002 = 0010				
9	053			
NO ANS	017			
TOTALS	0095	00203	ANS	02.13

TRAINING AVAILABILITY

0	081			
1 X 029 = 0029				
2 X 021 = 0042				
3 X 026 = 0078				
4 X 004 = 0016				
5 X 004 = 0020				
9	049			
NO ANS	021			
TOTALS	0084	00185	ANS	02.20

REFRESHER TRAINING

0	090			
1 X 020 = 0020				
2 X 007 = 0014				
3 X 013 = 0039				
4 X 001 = 0004				
5 X 001 = 0005				
9	084			
NO ANS	019			
TOTALS	0042	00082	ANS	01.95

FLEET EXERCISES

0	092			
1 X 018 = 0018				
2 X 004 = 0008				
3 X 013 = 0039				
4 X 002 = 0008				
5 X 000 = 0000				
9	083			
NO ANS	023			
TOTALS	0037	00073	ANS	01.97

TABLE D2-108.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

COMMUNICATIONS / VISUAL

CLASSROOM (FORMAL, INDIVIDUAL)

0	009			
1 X	020 = 0020			
2 X	044 = 0088			
3 X	097 = 0291			
4 X	031 = 0124			
5 X	024 = 0120			
9	003			
NO ANS	007			
TOTALS	0216	00643	ANS	02.97

ON-THE-JOB TRAINING

0	002			
1 X	002 = 0002			
2 X	006 = 0012			
3 X	031 = 0093			
4 X	037 = 0148			
5 X	149 = 0745			
9	002			
NO ANS	006			
TOTALS	0225	01000	ANS	04.44

SIMULATORS

0	077			
1 X	024 = 0024			
2 X	012 = 0024			
3 X	031 = 0093			
4 X	007 = 0028			
5 X	012 = 0060			
9	059			
NO ANS	013			
TOTALS	0086	00229	ANS	02.66

TEXTS/MANUALS/AUDIO-VISUAL

0	013			
1 X	012 = 0012			
2 X	026 = 0052			
3 X	101 = 0303			
4 X	041 = 0164			
5 X	031 = 0155			
9	005			
NO ANS	006			
TOTALS	0211	00686	ANS	03.25

TABLE D2-108. (Continued)
COMMUNICATIONS / VISUAL

TRAINING TEAMS/STD'S

0	063			
1 X 033 = 0033				
2 X 037 = 0074				
3 X 041 = 0123				
4 X 013 = 0052				
5 X 004 = 0020				
9	034			
NO ANS	010			
TOTALS	0128	00302	ANS	02.35

TRAINING AVAILABILITY

0	082			
1 X 020 = 0020				
2 X 036 = 0072				
3 X 038 = 0114				
4 X 007 = 0028				
5 X 005 = 0025				
9	034			
NO ANS	013			
TOTALS	0106	00259	ANS	02.44

REFRESHER TRAINING

0	078			
1 X 035 = 0035				
2 X 019 = 0038				
3 X 036 = 0108				
4 X 005 = 0020				
5 X 003 = 0015				
9	049			
NO ANS	010			
TOTALS	0098	00216	ANS	02.20

FLEET EXERCISES

0	071			
1 X 026 = 0026				
2 X 015 = 0030				
3 X 050 = 0150				
4 X 006 = 0024				
5 X 002 = 0010				
9	051			
NO ANS	014			
TOTALS	0099	00240	ANS	02.42

TABLE D2-109.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

COMMUNICATIONS / VOICE

CLASSROOM (FORMAL, INDIVIDUAL)

0	001		
1 X 010 = 0010			
2 X 020 = 0040			
3 X 105 = 0315			
4 X 045 = 0180			
5 X 026 = 0130			
9	007		
NO ANS	021		
TOTALS	0206	00675	ANS 03.27

ON-THE-JOB TRAINING

0	004		
1 X 011 = 0011			
2 X 017 = 0034			
3 X 056 = 0168			
4 X 048 = 0192			
5 X 070 = 0350			
9	008		
NO ANS	021		
TOTALS	0202	00755	ANS 03.73

SIMULATORS

0	004		
1 X 004 = 0004			
2 X 007 = 0014			
3 X 030 = 0090			
4 X 057 = 0228			
5 X 101 = 0505			
9	010		
NO ANS	022		
TOTALS	0199	00841	ANS 04.22

TEXTS/MANUALS/AUDIO-VISUAL

0	004		
1 X 009 = 0009			
2 X 038 = 0076			
3 X 113 = 0339			
4 X 026 = 0104			
5 X 016 = 0080			
9	007		
NO ANS	022		
TOTALS	0202	00608	ANS 03.00

TABLE D2-109. (Continued)
COMMUNICATIONS / VOICE

TRAINING TEAMS/STD'S

0	021				
1 X 015 =	0015				
2 X 022 =	0044				
3 X 070 =	0210				
4 X 047 =	0188				
5 X 024 =	0120				
9	013				
NO ANS	023				
TOTALS	0178	00577	ANS	03.24	

TRAINING AVAILABILITY

0	023			
1 X 022 =	0022			
2 X 024 =	0048			
3 X 066 =	0198			
4 X 042 =	0168			
5 X 023 =	0115			
9	011			
NO ANS	024			
TOTALS	0177	00551	ANS	03.11

REFRESHER TRAINING

0	002			
1 X 001 =	0001			
2 X 010 =	0020			
3 X 019 =	0057			
4 X 058 =	0232			
5 X 115 =	0575			
9	007			
NO ANS	023			
TOTALS	0203	00885	ANS	04.35

FLEET EXERCISES

0	011			
1 X 006 =	0006			
2 X 008 =	0016			
3 X 045 =	0135			
4 X 064 =	0256			
5 X 067 =	0335			
9	009			
NO ANS	025			
TOTALS	0190	00748	ANS	03.93

TABLE D2-110.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

COMMUNICATIONS / ON-LINE CRYPTO

CLASSROOM (FORMAL, INDIVIDUAL)

0	002			
1 X	011 =	0011		
2 X	019 =	0038		
3 X	107 =	0321		
4 X	041 =	0164		
5 X	027 =	0135		
9	007			
NO ANS	021			
TOTALS	0205	00669	ANS	03.26

ON-THE-JOB TRAINING

0	002			
1 X	009 =	0009		
2 X	011 =	0022		
3 X	062 =	0186		
4 X	050 =	0200		
5 X	072 =	0360		
9	008			
NO ANS.	021			
TOTALS	0204	00777	ANS	03.80

SIMULATORS

0	006			
1 X	003 =	0003		
2 X	007 =	0014		
3 X	035 =	0105		
4 X	056 =	0224		
5 X	097 =	0485		
9	009			
NO ANS	022			
TOTALS	0198	00831	ANS	04.19

TEXTS/MANUALS/AUDIO-VISUAL

0	003			
1 X	010 =	0010		
2 X	037 =	0074		
3 X	116 =	0348		
4 X	024 =	0096		
5 X	016 =	0080		
9	007			
NO ANS	022			
TOTALS	0203	00608	ANS	02.99

TABLE D2-110. (Continued)
COMMUNICATIONS / ON-LINE CRYPTO

TRAINING TEAMS/STD'S

0	016			
1 X 017 = 0017				
2 X 018 = 0036				
3 X 076 = 0228				
4 X 050 = 0200				
5 X 024 = 0120				
9	011			
NO ANS	023			
TOTALS	0185	00601	ANS	03.24

TRAINING AVAILABILITY

0	025			
1 X 018 = 0018				
2 X 024 = 0048				
3 X 071 = 0213				
4 X 039 = 0156				
5 X 023 = 0115				
9	011			
NO ANS	024			
TOTALS	0175	00550	ANS	03.14

REFRESHER TRAINING

0	002			
1 X 001 = 0001				
2 X 005 = 0010				
3 X 018 = 0054				
4 X 059 = 0236				
5 X 120 = 0600				
9	007			
NO ANS	023			
TOTALS	0203	00901	ANS	04.43

FLEET EXERCISES

0	009			
1 X 003 = 0003				
2 X 008 = 0016				
3 X 049 = 0147				
4 X 059 = 0236				
5 X 074 = 0370				
9	009			
NO ANS	024			
TOTALS	0193	00772	ANS	04.00

TABLE D2-111.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

COMMUNICATIONS / OFF-LINE CRYPTO

CLASSROOM (FORMAL, INDIVIDUAL)

0	001			
1 X 008 = 0008				
2 X 017 = 0034				
3 X 098 = 0294				
4 X 050 = 0200				
5 X 030 = 0150				
9	008			
NO ANS	023			
TOTALS	0203	00686	ANS	03.37

ON-THE-JOB TRAINING

0	003			
1 X 008 = 0008				
2 X 013 = 0026				
3 X 057 = 0171				
4 X 048 = 0192				
5 X 074 = 0370				
9	009			
NO ANS	023			
TOTALS	0200	00767	ANS	03.83

SIMULATORS

0	001			
1 X 002 = 0002				
2 X 001 = 0002				
3 X 018 = 0054				
4 X 046 = 0184				
5 X 135 = 0675				
9	008			
NO ANS	024			
TOTALS	0202	00917	ANS	04.53

TEXTS/MANUALS/AUDIO-VISUAL

0	002			
1 X 010 = 0010				
2 X 033 = 0066				
3 X 116 = 0348				
4 X 025 = 0100				
5 X 017 = 0085				
9	008			
NO ANS	024			
TOTALS	0201	00609	ANS	03.02

TABLE D2-111. (Continued)
COMMUNICATIONS / OFF-LINE CRYPTO

TRAINING TEAMS/STD'S

0	017			
1 X 014 =	0014			
2 X 018 =	0036			
3 X 069 =	0207			
4 X 049 =	0196			
5 X 029 =	0145			
9	014			
NO ANS	025			
TOTALS	0179	00598	ANS	03.34

TRAINING AVAILABILITY

0	020			
1 X 016 =	0016			
2 X 024 =	0048			
3 X 066 =	0198			
4 X 044 =	0176			
5 X 027 =	0135			
9	011			
NO ANS	027			
TOTALS	0177	00573	ANS	03.23

REFRESHER TRAINING

0	002			
1 X 002 =	0002			
2 X 003 =	0006			
3 X 021 =	0063			
4 X 047 =	0188			
5 X 127 =	0635			
9	008			
NO ANS	025			
TOTALS	0200	00894	ANS	04.47

FLEET EXERCISES

0	004			
1 X 002 =	0002			
2 X 004 =	0008			
3 X 040 =	0120			
4 X 045 =	0180			
5 X 102 =	0510			
9	010			
NO ANS	028			
TOTALS	0193	00820	ANS	04.24

TABLE D2-112.

NUMBER OF OFFICERS SURVEYED=235

RATING SCALE:

0=NOT SIGNIFICANT	4=ABOVE NORMAL SIG.
1=LOW SIGNIFICANCE	5=HIGH SIGNIFICANCE
2=BELOW NORM. SIG.	9=NOT RELEVANT
3=NORMAL SIG.	

DAMAGE CONTROL

CLASSROOM (FORMAL, INDIVIDUAL)

0	003			
1 X	016 =	0016		
2 X	043 =	0086		
3 X	110 =	0330		
4 X	028 =	0112		
5 X	022 =	0110		
9	003			
NO ANS	010			
TOTALS	0219	00654	ANS	02.98

ON-THE-JOB TRAINING

0	001			
1 X	000 =	0000		
2 X	005 =	0010		
3 X	031 =	0093		
4 X	057 =	0228		
5 X	129 =	0645		
9	003			
NO ANS	009			
TOTALS	0222	00976	ANS	04.39

SIMULATORS

0	005			
1 X	003 =	0003		
2 X	009 =	0018		
3 X	027 =	0081		
4 X	067 =	0268		
5 X	107 =	0535		
9	006			
NO ANS	011			
TOTALS	0213	00905	ANS	04.24

TEXTS/MANUALS/AUDIO-VISUAL

0	007			
1 X	019 =	0019		
2 X	047 =	0094		
3 X	112 =	0336		
4 X	019 =	0076		
5 X	017 =	0085		
9	003			
NO ANS	011			
TOTALS	0214	00610	ANS	02.85

TABLE D2-112. (Continued)
DAMAGE CONTROL

TRAINING TEAMS/STD'S

0	005					
1 X	007	= 0007				
2 X	011	= 0022				
3 X	053	= 0159				
4 X	095	= 0380				
5 X	051	= 0255				
9	004					
NO ANS	009					
TOTALS	0217		00823		ANS	03.79

TRAINING AVAILABILITY

0	028					
1 X	017	= 0017				
2 X	022	= 0044				
3 X	073	= 0219				
4 X	046	= 0184				
5 X	025	= 0125				
9	010					
NO ANS	014					
TOTALS	0183		00589		ANS	03.21

REFRESHER TRAINING

0	004					
1 X	003	= 0003				
2 X	009	= 0018				
3 X	031	= 0093				
4 X	062	= 0248				
5 X	114	= 0570				
9	004					
NO ANS	008					
TOTALS	0219		00932		ANS	04.25

FLEET EXERCISES

0	034					
1 X	017	= 0017				
2 X	022	= 0044				
3 X	070	= 0210				
4 X	020	= 0080				
5 X	026	= 0130				
9	027					
NO ANS	019					
TOTALS	0155		00481		ANS	03.10

APPENDIX D - PART 2

SECTION III - MISSION/SYSTEMS/TRAINING ASSESSMENT

SECTION III - MISSION/SYSTEMS/TRAINING ASSESSMENT

Table D2-113 presents seventeen statements relating to mission, system and training assessments and shows the degree to which the average of all officers queried agree with them.

Table D2-114 which follows presents a breakdown of answers for all statements and shows where opinions varied widely and where relative unanimity was exhibited.

TABLE D2-113.

Read each of the following statements carefully and indicate in the blank space to the left of each how much you agree or disagree with it. Use one of the following numbers to indicate your choice:

1 - Strongly Disagree	4 - Slightly Agree
2 - Moderately Disagree	5 - Moderately Agree
3 - Slightly Disagree	6 - Strongly Agree

1. 4.3 In general, U. S. Coast Guard units maintain a high level of operational readiness.

2. 3.3 WHEC crewmen are generally better qualified than their WMEC counterparts because of their more frequent and intense training.

3. 3.5 The current scope of U. S. Coast Guard operational training is adequate to maintain an acceptable level of fleet readiness.

4. 5.8 OJT is fundamental to retention of skills between scheduled training exercises.

5. 4.8 In order to be totally effective, the Bridge/CIC-ASW/Communications/Engineering team should be together for at least one year.

6. 4.6 Due to the multi-mission assignment of most floating units, optimum proficiency in each mission at all times is not possible.

7. 4.1 Refresher training assures the optimum level of readiness for each department.

8. 3.5 In terms of mission complexity and training demand, Navigation and CIC/ASW operations are the most significant.

9. 4.0 Operation Department team effectivity is difficult to maintain with the current mix of training opportunities and allocation.

10. 4.0 Any increase in the frequency and/or intensity of current navigation and CIC training would significantly increase unit performance.

11. 5.5 Many of the problems associated with maintaining team proficiency are due to personnel transfers and/or reassignment of responsibility.

12. 4.7 Upon assignment to a seagoing billet, many enlisted personnel require specialized or refresher training ashore.

13. 3.5 Properly implemented and applied, Unit Training Manual Afloat exercises consume at least 50% of an average day's activities.

14. 5.1 Introduction of new missions and/or systems-equipments requires a broad-based training effort both at shore-based schools and aboard the operating unit.

15. 4.8 Introduction of advanced systems such as COMDAC will require significant changes in the current methods used to train operations personnel.

16. 4.2 Specific function simulators such as radar navigation, and ASW, with high training transfer ratios, can effectively duplicate seagoing experience.

17. 4.7 Simulators, properly employed, can provide fundamental (entry-level), refresher and advanced ship handling training, thus substantially shortening the "learning curve" in specific areas.

TABLE D2-114.

NUMBER OF OFFICERS SURVEYED=235

MISSION/SYSTEMS/TRAINING ASSESSMENT			AVERAGE VALUE
QUESTION 1			4.3
STRONGLY DISAGREE	008	03.41%	
MODERATELY DISAGREE	018	07.69%	
SLIGHTLY DISAGREE	021	08.97%	
SLIGHTLY AGREE	065	27.77%	
MODERATELY AGREE	100	42.73%	
STRONGLY AGREE	022	09.40%	
NO ANSWER	001		
QUESTION 2			3.3
STRONGLY DISAGREE	027	12.00%	
MODERATELY DISAGREE	038	16.88%	
SLIGHTLY DISAGREE	061	27.11%	
SLIGHTLY AGREE	052	23.11%	
MODERATELY AGREE	035	15.55%	
STRONGLY AGREE	012	05.33%	
NO ANSWER	010		
QUESTION 3			3.5
STRONGLY DISAGREE	020	08.58%	
MODERATELY DISAGREE	033	14.16%	
SLIGHTLY DISAGREE	054	23.17%	
SLIGHTLY AGREE	064	27.46%	
MODERATELY AGREE	054	23.17%	
STRONGLY AGREE	008	03.43%	
NO ANSWER	002		
QUESTION 4			5.8
STRONGLY DISAGREE	001	00.42%	
MODERATELY DISAGREE	001	00.42%	
SLIGHTLY DISAGREE	001	00.42%	
SLIGHTLY AGREE	006	02.55%	
MODERATELY AGREE	030	12.76%	
STRONGLY AGREE	196	83.40%	
NO ANSWER	000		
QUESTION 5			4.8
STRONGLY DISAGREE	009	03.84%	
MODERATELY DISAGREE	014	05.98%	
SLIGHTLY DISAGREE	016	06.83%	
SLIGHTLY AGREE	034	14.52%	
MODERATELY AGREE	056	23.93%	
STRONGLY AGREE	105	44.87%	
NO ANSWER	001		

TABLE D2-114. (Continued)

			AVERAGE VALUE
QUESTION 6			4.6
STRONGLY DISAGREE	012	05.12%	
MODERATELY DISAGREE	012	05.12%	
SLIGHTLY DISAGREE	022	09.40%	
SLIGHTLY AGREE	044	18.80%	
MODERATELY AGREE	062	26.49%	
STRONGLY AGREE	082	35.04%	
NO ANSWER	001		
QUESTION 7			4.1
STRONGLY DISAGREE	016	06.86%	
MODERATELY DISAGREE	027	11.58%	
SLIGHTLY DISAGREE	033	14.16%	
SLIGHTLY AGREE	047	20.17%	
MODERATELY AGREE	072	30.90%	
STRONGLY AGREE	038	16.30%	
NO ANSWER	002		
QUESTION 8			3.5
STRONGLY DISAGREE	014	06.03%	
MODERATELY DISAGREE	052	22.41%	
SLIGHTLY DISAGREE	057	24.56%	
SLIGHTLY AGREE	048	20.68%	
MODERATELY AGREE	046	19.82%	
STRONGLY AGREE	015	06.46%	
NO ANSWER	003		
QUESTION 9			4.0
STRONGLY DISAGREE	003	01.29%	
MODERATELY DISAGREE	020	08.62%	
SLIGHTLY DISAGREE	045	19.39%	
SLIGHTLY AGREE	085	36.63%	
MODERATELY AGREE	058	25.00%	
STRONGLY AGREE	021	09.05%	
NO ANSWER	003		

TABLE D2-114. (Continued.

			AVERAGE VALUE
QUESTION 10			4.0
STRONGLY DISAGREE	005	02.15%	
MODERATELY DISAGREE	015	06.46%	
SLIGHTLY DISAGREE	042	18.10%	
SLIGHTLY AGREE	096	41.37%	
MODERATELY AGREE	053	22.84%	
STRONGLY AGREE	021	09.05%	
NO ANSWER	003		
QUESTION 11			5.5
STRONGLY DISAGREE	000	00.00%	
MODERATELY DISAGREE	001	00.42%	
SLIGHTLY DISAGREE	004	01.70%	
SLIGHTLY AGREE	026	11.11%	
MODERATELY AGREE	056	23.93%	
STRONGLY AGREE	147	62.82%	
NO ANSWER	001		
QUESTION 12			4.7
STRONGLY DISAGREE	002	00.85%	
MODERATELY DISAGREE	013	05.53%	
SLIGHTLY DISAGREE	021	08.93%	
SLIGHTLY AGREE	054	22.97%	
MODERATELY AGREE	069	29.36%	
STRONGLY AGREE	076	32.34%	
NO ANSWER	000		
QUESTION 13			3.5
STRONGLY DISAGREE	034	14.71%	
MODERATELY DISAGREE	035	15.15%	
SLIGHTLY DISAGREE	047	20.34%	
SLIGHTLY AGREE	045	19.48%	
MODERATELY AGREE	044	19.04%	
STRONGLY AGREE	026	11.25%	
NO ANSWER	004		

TABLE D2-114. (Continued).

				AVERAGE VALUE
QUESTION 14				5.1
STRONGLY DISAGREE	=	001	= 00.42%	
MODERATELY DISAGREE	=	005	= 02.13%	
SLIGHTLY DISAGREE	=	011	= 04.70%	
SLIGHTLY AGREE	=	035	= 14.95%	
MODERATELY AGREE	=	078	= 33.33%	
STRONGLY AGREE	=	104	= 44.44%	
NO ANSWER	=	001		
QUESTION 15				4.8
STRONGLY DISAGREE	=	000	= 00.00%	
MODERATELY DISAGREE	=	005	= 02.41%	
SLIGHTLY DISAGREE	=	013	= 06.28%	
SLIGHTLY AGREE	=	064	= 30.91%	
MODERATELY AGREE	=	068	= 32.85%	
STRONGLY AGREE	=	057	= 27.53%	
NO ANSWER	=	028		
QUESTION 16				4.2
STRONGLY DISAGREE	=	018	= 07.79%	
MODERATELY DISAGREE	=	013	= 05.62%	
SLIGHTLY DISAGREE	=	026	= 11.25%	
SLIGHTLY AGREE	=	061	= 26.40%	
MODERATELY AGREE	=	079	= 34.19%	
STRONGLY AGREE	=	034	= 14.71%	
NO ANSWER	=	004		
QUESTION 17				4.7
STRONGLY DISAGREE	=	006	= 02.57%	
MODERATELY DISAGREE	=	010	= 04.29%	
SLIGHTLY DISAGREE	=	015	= 06.43%	
SLIGHTLY AGREE	=	057	= 24.46%	
MODERATELY AGREE	=	074	= 31.75%	
STRONGLY AGREE	=	071	= 30.47%	
NO ANSWER	=	002		

A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY BE EFFECTIVELY APPLIED TO THE ACCOMPLISHMENT OF COAST GUARD VESSEL OPERATIONAL TRAINING

CONTRACT DOT-CG-61814A

APPENDIX E

OPERATIONAL TRAINING COST ANALYSIS

PREPARED FOR

U. S. Coast Guard
400 Seventh Street, S.W.
Washington, D.C. 20590

PREPARED BY

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April 30, 1977

Rev 7-21-77

APPENDIX E

OPERATIONAL TRAINING COST ANALYSIS

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APPENDIX E

OPERATIONAL TRAINING COST ANALYSIS

LIST OF TABLES

LIST OF TABLES

(Continued)

APPENDIX E

OPERATIONAL TRAINING COST ANALYSIS

E1.0 General

A cost review of current operational training (defined as all formalized training conducted while afloat) was performed, based on descriptions of such training gathered from published documents and/or personal interviews. The accuracy of the information presented is constrained by the availability of precise training curriculum data and the level of detailed cost information available. Certainly, the basic cost data is believed to be the most accurate currently available. This analysis was structured to provide a cost basis upon which to examine operational training alternatives--namely, simulation. It was therefore necessary to define a common basis for this comparison which was determined to be the cost per man hour of 'hands-on' training. This is defined to be only the time that the student is actively involved in the operation such as while on watch. This is considered a fair basis for comparison since all simulator training would consist of 'hands-on' time.

E1.1 Data Sources

In general, both cost and training curriculum data were secured directly from responsible personnel at each of the representative training facilities surveyed. Other supportive cost data was supplied directly by USCG Headquarters. In some cases, specific cost elements, necessary for the development of certain parameters unique to the study, were not readily available from existing records. In these cases reasonable estimates were derived from similar applications.

E1.2 Presentation Format

The training cost analysis is performed for the following operational training facilities:

a. USCG Academy - Academy Professional and Military Training

b. LANTAREA Fixed and Mobile Training Facilities - Operational Training

c. Reserve Training Center, Yorktown, Virginia - Officer Candidate School

d. Reserve Training Center, Yorktown, Virginia - Small Boat Crew Training

Each of the foregoing training sources is discussed and an outline of the operational content of each course is identified. This dissertation for each source is followed by a table presenting the cost analysis.

E2.0 SMALL BOAT (SAR) CREW TRAINING - RESERVE TRAINING CENTER, YORKTOWN, VIRGINIA

E2.1 GENERAL

The school provides a 12-week program of Boatswains Mate ("A" school) which is comprised of three parts:

1. General training for boat crewmen
2. Specific training for members of boat crews
3. Advanced training for boat coxswains

Three weeks involve training for operation of 31' boats, approximately 40 hours of which is underway-hands-on type training in basic chart reading, navigation, boat handling and docking. The Center has five of these boats, although due to maintenance and other commitments, all are not usually available for coxswain training. Students are scheduled so that no more than five are assigned to each boat for training purposes. Actual coxswain certification is not achieved by students completing the 12-week program since certification requires a minimum 40 hours boat handling time. Certification is completed by students at their assigned units under cognizance of their supervisor (CO, OIC).

E2.2 SUBJECTS

The following major subjects are covered:

Group A

Seamanship and Safety
Small Boat Equipment
First Aid (Survivor Operations)
Damage Control
Engineering - General
Operational Reports
Piloting

Group B

Small Boat - Operation
Small Boat - Engineering
Small Boat - Navigation
Communications
Search and Rescue

Group C

Small Boat Operation - Advanced
Small Boat Navigation - Advanced
Search and Rescue - Advanced

E2.3 OPERATIONAL TRAINING

Small boat handling operations included in the courses above are further detailed below:

Group B

Small Boat Operation - Practical demonstration required, for each type of small boat assigned to the unit, for each of the following tasks:

- Single and twin screw approaches and going alongside
- Handling and docking of disabled vessels in tow
- Righting and towing of small sailboats
- Handling swamped small boats
- Assisting grounded vessels
- Inclement weather operations
- Crash Boat operations with Fixed Wing Aircraft
- Boat operations with rotary wing aircraft

Small Boat Engineering - Practical demonstration required for each boat type.

- Routine engine checks
- Faulty engine operation
- Starting/securing main engine
- Engine operating checks

Small Boat Navigation - Practical demonstration required.

- Plot compass courses, obtain distances and time to run
- Use tide tables, current tables
- Fog Navigation - demonstrate by plotting a course between two fixed points, giving effect to tide and current, time and speed. Conduct run and evaluate results.

Group C

These operations are similar to those of Group B but are more extensive/complex.

In addition to the 12-week Boatswains Mate course, the school also conducts a Small Boat Operations (SBO) course which is a two-week program covering PSB(31") operations. Although condensed, this course also provides 40 hours of underway-hands-on type training.

Table E2-1, Small Boat (SAR) Training Cost Analysis, derives the current cost per man-hour of training aboard PSB's as currently conducted at Yorktown. Cost element "V" is the total cost per man hour of underway training which assumes that all underway time is production training time. Cost element "W" is the cost to provide actual "hands-on" training per man hour. This analysis is somewhat conservative since it assumes that 5 PSB's are actively providing training at all times, thus limiting the number of students per boat to four. Obviously, if the number of students were to increase per boat, due to increased class size or unavailability of one or more PSB's, then a students "hands-on" training time would decrease and the cost per man-hour would increase.

TABLE E2-1. SMALL BOAT (SAR) CREW TRAINING COST ANALYSIS

ELEMENT	FACTOR	REMARKS
A. Number of 31' boats (units) assigned for training	5	These are 31' Port Safety Boats (PSB) used for coxswain training.
B. Number of hours of operationally oriented training per class	B_1 - 105 hours	The 12-week Bos'n Mates School has 3 weeks (35 hrs/wk) operations training
	B_2 - 70 hours	For 2-week Small Boat Ops Course (35 hrs/wk)
	Total = 175 hours	
C. Number of hours of actual underway training per class	40 hours	True for both Bos'n Mates School and Small Boat Ops course.
D. Number of classes per calendar year	D_1 20 classes D_2 16 classes Total = 36 classes	Average 20 classes for 12-week course Average 16 classes for 2-week course
E. Total number of hours of operationally oriented training/annum	3220 hours	$B_1 \times D_1 + B_2 \times D_2$
F. Total number of class hours of underway training per annum	1440 hours	C x D
G. Total annual number of hours of underway training	7200 hours	(FxH) ÷ 4 That is, FxH=total man hours of training; 4= number of students assigned to each boat
H. Average number of students per class	20	True for both Bos'n Mates School and Small Boat Ops Course
I. Average number of students trained per year	720	D x H
J. Average number of students trained per unit	144	I ÷ A
J_1 Average hands-on time per student	30 hours	Varies with no. students; 3 active positions, Operator, Pilot, Lookout. Each 4 student/10 hrs per active position (total 30 hrs) + 10 hrs as observers.
K. Total unit fuel/maintenance cost per annum	$86,400	
L. Fuel/maintenance cost per unit/hour	$12.00	K ÷ G

TABLE E2-1. (continued)

ELEMENT	FACTOR	REMARKS
M. Annual instructor/crew costs for underway training	\$15.63/hr x G \$112,536	Assuming one instructor and one boat engineer assigned to each boat. 13K + 25% x 2 (enlisted) = 32.5K ÷ 2080= hourly instructor/crew cost/boat
N. Instructor/crew costs for underway training per unit	\$22,507	M ÷ A
O. Annual depreciation per unit	\$5,000	Acquisition cost and life expectancy, assume 50K and 10 years or 5K/year. (The FY76 Budget, Page AC-20 estimates 97K acquisition cost of new PSB's.
P. Total annual direct cost of underway training	\$198,936	K + M
Q. Total annual direct cost of underway training per unit	\$39,787	P ÷ A
R. Direct cost of underway training per unit/hour	\$27.63	Q ÷ F
S. Total underway training man hours	28,800	C x I
T. Direct cost of underway training per man hour	\$6.91	P ÷ S
U. Direct cost of underway training per actual "hands-on" man hour	\$9.21	$P \div (I \times J_1)$
V. Total cost of underway training per man hour	\$7.51	$K + M + A\ (\frac{1}{2080} \times F) \div S$
W. Total cost of underway training per actual "hands-on" man hour	\$10.01	$K + M + A\ (\frac{1}{2080} \times F) \div (I \times J_1)$

E3.0 OFFICER CANDIDATE SCHOOL (OCS) - RESERVE TRAINING CENTER, YORKTOWN, VIRGINIA

E3.1 APPOINTMENT OF OCS GRADUATES

Chief Warrant Officers, warrant officers and enlisted men who are selected for and successfully complete the Officer Candidate School, may be tendered appointments as temporary officers in the Coast Guard in the grade of ensign. These graduates serve an initial period of active duty of three years. After a probationary period of four years these career Coast Guardsmen are offered permanent appointment as commissioned officers.

E3.2 THE OCS PROGRAM - GENERAL DESCRIPTION

OCS is a 17-week course of training (40 hours/week) at the Reserve Training Center, Yorktown, Virginia. Students are trained for minimum entry-level indoctrination which must be supplemented by experience (OJT) if any significant seagoing responsibility is to be assumed. However, since only about 10% (8-10 students) from each class actually get assigned to seagoing billets, there is no real reason to expand the operational elements of the course. Two 17-week cycles are run each year (the school is closed in summer) with a total class size of from 160-180 (80-90 students per cycle). Approximately 40-50% of the typical student complement had prior service experience (including mariners), the rest are civilians (college graduates).

There are three types of boats/vessels used in operational training of OCS students: 31' boats, a 125' Patrol Boat (Cuyahoga) and a 210' WMEC (Reliance). The smaller boats have minimal navigation equipment; i.e., magnetic compass, fathometer, and communications gear. In addition to the foregoing equipments, the Cuyahoga carries a radar. This boat is used for two purposes: (1) to provide boat docking drills for each student and student group (about 9 per session), and (2) to provide navigation underway training during a weekend (two-day) cruise. Each student gets a small amount (7 to 10 minutes) of 'hands-on' training at each of 10 ship handling positions during these cruises. The WMEC Reliance fulfills a dual role, as a trainer for OCS and as an operational cutter. The Reliance takes groups of 25-30 students on 5-day cruises which also serve as patrols (fisheries, etc.). The on-board training syllabus presented is for OOD qualification, i.e., since, in actuality, the OOD must know all departments, training for this position covers everything; navigation, CIC, bridge, communications, engineering, etc.

In addition to the underway operational training, Yorktown has a make-shift CIC room comprised of two radars, plotting table, intercoms and a vintage bridge mock-up. This is used to teach navigation and plotting techniques, and each student gets approximately 12 hours of such instruction.

E3.3 COURSE DESCRIPTION

The OCS course material covers four subject classes: Leadership, Seamanship/Readiness, Navigation/Operations and Orientation/Administration. Of primary interest is the Seamanship/Readiness and Navigation/Operations syllabi and these are discussed in detail below:

Navigation/Operations Syllabus

The objective is to provide the Officer Candidate with a basic knowledge of navigation and other specific shipboard operations as encompassed in the following courses:

- Navigation - Piloting, Celestial

  Covers 66 hours of instruction over 34 subject titles.

- Operations - Maneuvering Board and Relative Motion (CIC) Course, Search and Rescue (SAR) Course, Communications/Security (COMSEC) Course

  Covers 67 hours of instruction over 30 subject titles.

Seamanship/Readiness Syllabus

The objective is to provide the Officer Candidate with a basic knowledge of shipboard officer duties as encompassed in the following courses:

- Deck Watch Officer
- Gunnery
- Engineering

The foregoing courses cover 70 hours of formal instruction over 40 subject titles, supported by 28 hours of underway instruction together with a weekend cruise aboard the Cuyahoga and a 5-day cruise aboard the Reliance. Cost analyses tables for the indicated underway instruction are identified as follows:

- Small Boats (4 hrs.) - Practical exercises aboard 31' Boat. (Table E3-1)
- Cuyahoga (24 hrs.) - Basic Seamanship, Shipboard Familiarization and Indoctrination, Docking Exercises, Deck Force (Table E3-2)
- Cuyahoga (weekend cruise) - Officer Candidates stand all required bridge, navigation watches, conduct drills, etc. (Table E3-2)
- USCGC RELIANCE (5-day cruise) - Underway OOD Qualification (Table E3-3)

TABLE E3-1. OCS - SMALL BOATS (31-FOOT PSB) TRAINING COST ANALYSIS

ELEMENT	FACTOR	REMARKS
A. Number of hours allocated for actual underway training per class	4 hrs.	Rules of Road, Lights, Fog Signals, Steering, Sailing
B. Total number of OCS classes/ annum	2	2-17 week classes conducted-total 34 weeks. Closed in summer.
C. Total hours of underway training allocated per annum	8 hrs.	A x B
D. Number of sub-class sections per class	6	
E. Total sub-class sections trained per annum	12	B x D
F. Number of sections per under-way training group	2	Sections are paired
G. Number of underway groups per class	3	D ÷ F
H. Number of underway groups trained per annum	6	B x G
I. Total underway operations training per class	12 hrs.	A x G
J. Total underway operations training per annum	24 hrs.	B x I
K. Total underway training time per boat per annum	24 hrs.	Each boat fully utilized
L. Number of 31' boats assigned for training	5	
M. Total underway training operations per annum - all boats	120 hrs.	K x L
N. Average number of students per class	85	Total approx 170 students per year
O. Average number of students per section	14.167	N ÷ D
P. Number of students trained at each underway session	28.334	
Q. Average number of students per boat	5.667	P ÷ L
R. Average hands-on time per student	2.14 hrs. or 0.7 hrs at each of 3 active positions	4 hrs. x 3 active positions = 12 active hrs. ÷ 5.6 students = 2.14 hrs/student at active positions and 1.86 hrs. as observers

TABLE E3-1. (continued)

ELEMENT	FACTOR	REMARKS
S. Annual instructor/crew costs for underway training	(15.63/hr x M) =$1876	Assuming one instructor and one boat engineer per boat: 13K + 25% x 2 (enlisted) = 32.5 K ÷ 2080 = hourly instructor/crew cost
T. Hourly fuel/maintenance cost/ boat	$12.00	
U. Total fuel/maintenance cost per annum	$1,440	M x T
V. Annual depreciation/boat	5,000	50K acquisition for 10 yrs.
W. Total annual direct cost of underway training	$3316	S + U
X. Total annual direct cost of underway training per boat	$663	W ÷ L
Y. Direct cost of underway training per unit/hour	$27.63	X ÷ K
Z. Total underway training man-hours per annum	680	A x 2N
AA. Direct cost of underway training per man hour	$4.86	W ÷ Z
BB. Direct cost of underway training per actual "hands-on" man hour.	$9.11	W ÷ (R x 2N)
CC. Total cost of underway training per man hour	$5.30	$\left[S + U + L\left(\frac{V}{2080} \times K\right)\right] \div Z$
DD. Total cost of underway training per actual "hands-on" man hour.	$9.91	$\left[S + U + L\left(\frac{V}{2080} \times K\right)\right] \div (R \times 2N)$

TABLE E3-2. OCS-CUYAHOGA TRAINING COST ANALYSIS

Element	Factor	Remarks
A. Number of hours of operationally oriented training per class.	133 hours Nav/Ops 98 hours Sea/Readiness 231 total	
B. Number of hours of actual underway training per class.	8 Introduction 16 Docking/Mooring 32 Hrs. Weekend 56 Total Cuyahoga	An initial 8 hours is used for indoctrination.
C. Number of OCS classes per calendar year	2	17 week course - total 34 weeks; closed in summer
D. Total number of hours of operationally oriented training/annum.	462 hours	A x C
E. Total number of assigned class hours of underway training per annum.	112 hours	B x C
F. Total annual number of hours of actual underway training operations.	624* hours	Each OCS "class" has 6 sections, each of which receives underway Cuyahoga training individually except for the Introductory class (8 hours) for which the sections are paired into 3 groups.
G. Average number of students per class.	85	Total 170/annum. With six subclass groups there would be approximately 15 students per section.
H. Average hands-on (watch) time per student	37 hours	10 position assignments aboard with approximately 15 students per underway session. 560 position hours ÷ 15.
I. Average number of students per underway session	15	
J. Total fuel/maintenance and support cost per annum	55 K	35 K Fuel/Maintenance; 1.4 K Electronic program; 18.6 K vessel program

TABLE E3-2. OCS - CUYAHOGA (continued)

Element	Factor	Remarks
K. Fuel/maintenance cost per underway hour	\$88	J ÷ F
L. Annual instructor/crew costs for underway training	123 K	Includes 1 CWO and 10 enlisted personnel plus staff provisioning
M. Instructor/crew cost per underway hour	\$197	L ÷ F
N. Annual depreciation	-0-	
O. Total annual direct cost of underway training	\$178 K	J + L
P. Direct cost of underway training per hour	\$285	O ÷ F
Q. Total underway training man hours per annum	9,520	B x (2 x G)
R. Direct cost of underway training per man hour	\$18.70	O ÷ Q
S. Direct cost of underway training per actual hards-on (watch) time man hours	\$28.30	O ÷ (H x 2G)

*Cuyahoga I 8 hours x 3 groups/class
II 8 hours x 6 groups/class
III 8 hours x 6 groups/class
IV 32 hours x 6 groups/class

312 hours/class x 2 classes per annum = 624 hours actual Cuyahoga underway time/year

TABLE E3-3. OCS - RELIANCE TRAINING COST ANALYSIS

Element	Factor	Remarks
A. Number of hours of actual underway training per class	144 hours	6-day cruise x 24 hours/day
B. Number of OCS classes per calendar year	2	
C. Total assigned class hours of underway training per annum	288 hours	A x B
D. Number of cruises scheduled per annum to accomplish training	6	3 cruises per class x 2 classes/annum
E. Total annual hours of actual underway training operations	864 hours	A x D
F. Average number of students per class	85	170 per year
G. Average number of students per cruise	28.333	2F ÷ D
H. Average hands-on (watch) training time per student	48 hours	Each student stands 11 4-hour watches and 2 dogged (2-hour) watches
I. Total fuel/maintenance and support costs per annum for training	$49,536	1250.70 (FY75) + 10% = $1376.00 per day (FY76). 6 cruises x 6 days/cruise= 36 cruise days
J. Fuel/maintenance and support cost per underway training hour	$57.33	I ÷ E
K. Annual operating cost for cruise training	$171,612	780K (FY75) + 10% = 858K annual operating cost (FY76) ÷ 180 operating days/annum = $4,767 per day for 36 cruise training days.
L. Operating cost per underway training hour	$199	K ÷ E
M. Annual depreciation allocated to cruise training	$119,988	Based on 18M acquisition cost and 30-year term and 180-day operating year: $3,333/operating day for 36 cruise training days.
N. Depreciation per underway training hour	$139	M ÷ E

TABLE E3-3. OCS - RELIANCE (continued)
TRAINING COST ANALYSIS

Element	Factor	Remarks
O. Total annual direct cost of underway training	$221,148	I + K
P. Direct cost of underway training per hour	$256	O ÷ E
Q. Total underway training manhours per annum	24,480	A x 2F
R. Direct cost of underway training per man hour	$9.03	O ÷ Q
S. Direct cost of underway training per actual "on-watch" man hours	$27.10	O ÷ (H x 2F)
T. Total cost of underway training per man hour	$13.94	I + K + M ÷ Q
U. Total cost of underway training per actual "hands-on" man hour.	$41.81	I + K + M ÷ (H x 2F)

E4.0 ACADEMY PROFESSIONAL AND MILITARY TRAINING

E4.1 INTRODUCTION

USCG Academy Professional training is described and evaluated with respect to recent training committee reports/findings, and derived cost factors for providing operational training to Cadets.

E4.2 FORMAL COURSES

NAUTICAL SCIENCE AND LAW DEPARTMENT

Nautical Science Course Description

Nautical Science I; First Year, Fall Semester (Class: 3hrs/wk, Lab: 2 hrs/wk)

1. Rules of Road
2. Relative Motion
3. Terrestial Navigation
4. Piloting Techniques
5. Navigational Instruments
6. Charts/Publications
7. Solving Relative Motion and Tactical Maneuvering Problems
8. Magnetic/Gyro and Tide/Tidal Current Theory and Problem Solution
9. Plot work and Data Interpretation in Position Determination
10. Introduction to Electronics Systems and Applications

Nautical Science II; First Year, Spring Semester (Class: 3 hrs/wk, Lab: 2 hrs/wk)

1. Theoretical Celestial Navigation
2. Methods of Solutions of the Astronomical Triangle for Lines of Position
3. Determination of Compass Error by Celestial Methods
4. Solutions of Time Problems
5. Emphasize Plotting Proficiency and the Complete Celestial Solution

Nautical Science III; Fourth Year, Fall Semester
(Class: 3 hrs/wk, Lab: 2 hrs/wk)

1. Navigational Skills (final development)
2. Rules of Road (review)
3. Weapon System Maintenance and Operation
4. Communications
5. Advanced Seamanship Theory and Practice
6. Shipboard Safety

Nautical Science IV; Fourth Year, Spring Semester (Class: 3 hrs/wk, Lab: 3 hrs/wk)

1. Preparation for First Duty Station
2. Shipboard Organization
3. Supply System
4. Practical Seamanship
5. Individualized duty oriented program per billet assignment

E4.2.1 Summary

N/S I - Provides 44 class hours across 29 class topics and 26 hours of lab across 12 topics. The objective is to provide sufficient detail to enable students to successfully analyze and resolve navigational problems. This is a "basic fundamentals" course presented in the Fall semester to new (4th class) Cadets.

N/S II - Provides 45 class hours across 33 class topics and 32.5 hours of lab across 13 topics. This is a basic celestial navigation course presented in the Spring to 4C students which, together with N/S I, completes instruction in the fundamentals of Marine Navigation.

N/S III - Provides 17.5 class hours across 4 class topics and an additional 17.5 hours aboard the T-boats. The objective is to present the 1C Cadets, in the final Fall semester, with practical and theoretical seamanship problems.

N/S IV - Provides 43 class hours across 36 class topics and 35 hours of lab across 12 topics presented in the final Spring semester. The objective is to familiarize the soon-to-be-graduated Cadet with Coast Guard shipboard organization and junior officer responsibilities.

E4.3 SUMMER PROGRAMS

The foregoing courses are supplemented by summer cruises which are currently structured as follows: 4th class - one week; 3rd class - 10 weeks in summer plus 2 weeks aboard an operating cutter during regular school year; 2nd class - 2 weeks, 1st class - 7 to 10 weeks.

Cruise training for underclassmen is conducted in accordance with the Professional Qualifications Notebook (PQ) which requires demonstration of specific tasks/skills within the categories: Seamanship, Navigation, Gunnery, Communications, CIC/ASW, Oceanography-Meteorology, Engineering, Damage Control. In addition, the Professional Qualifications Notebook (PQ) for Underclass Cadets requires that they know and/or demonstrate the various specific tasks, and the equipment/materials associated with each, required of personnel performing the following assignments:

- Messenger of the Watch
- Helmsman
- Lookout
- Quartermaster of the Watch
- Signalman of the Watch
- Boatswain's Mate of the Watch

Cruise shipboard training for First and Second Class Cadets is conducted in accordance with the Junior Deck Officer Training Course (CG415-1) which covers all operating departments and tasks. Typically, the Atlantic and Pacific area assign HEC's for summer cruise training, which in 1976 was scheduled as follows:

	PACAREA	LANTAREA	TOTAL
Cadets scheduled to be trained	120	185	305
Cutter days required per itinerary	100	155	255

E4.4 SHIP HANDLING TRAINING

Other than summer cruises, the Academy has 4 "T" boats that are used for ship maneuvering/docking training. These boats currently have no radar, DF or other electronic navigation aids, but have recently been outfitted with anchor machinery and have been re-engined, which should provide an additional 10 years useful life.

Other suggestions for short-term upgrading for "T" boats include a gyrocompass, radar, electronic navigation equipment, and reconfiguration of the mess deck for use as a classroom. Estimated cost for all of these "T" boat modifications is 317K.

E4.5 EXCERPTS FROM THE 1976 ACADEMY PMT COMMITTEE REPORT

Pertinent results of the 2nd Annual (1976) Professional and Military Training Committee (PMTC) meeting are summarized as follows:

Summary of results of survey questionnaires covering the professional capabilities of recent Academy graduates:

(1) According to over 150 CO's, XO's and EO's, recent Academy graduates are unsatisfactorily prepared for: watch standing, ship handling, dealing with subordinates. Professional knowledge is also indicated as an area of weakness.

(2) The "Job Entry" philosophy of training provided by the Academy is not being accomplished according to the CO/XO/EO's polled.

(3) Recent graduates assessed the most helpful (in terms of preparation for duty) Academy courses as follows:

First -- Experience derived on Cadet cruises - the smaller the group assigned to an individual unit, the more beneficial the cruise experience, i.e., cadets should be placed on operating units.

Second -- Nautical Science courses - NS/IV should be specifically directed to needs of the new graduate.

Third -- Practical experience and training obtained using "T" boats.

(4) Improvements recommended by CO/XO/EO's for Academy preparation of graduates for first assignment:

(a) More contact with real Coast Guard

(b) More real Coast Guard leadership experience

(c) More emphasis on Coast Guard unit administration and organization

(d) More seamanship and navigation

(5) Recommended Improvements in the Saturday Morning Program:

(a) The importance, status, purpose and relevancy of the program should be clearly presented to cadets.

(b) Reduce the size of the groups - mass lectures are unsatisfactory.

(c) Attendance should be mandatory.

(d) Use prime time (Monday to Friday) for presenting "Saturday Morning" subjects.

(6) Utilization of Academy Graduates: Approximately 20 primary duties were assigned to new ensigns which varied primarily with the class/mission of the ships involved. The most commonly assigned were DWO, Communications/ CMS Officer, Weapons Officer, First Lieutenant and Exchange Officer. None of the CO/XO/EO's polled reported excellent to outstanding preparation for any of the primary duties. Both Engineering Students and their Supervisors (EO's) indicated that there was virtually no professional or practical preparation of the cadet for such duty.

(7) Summary Recommendations

PMT Committee recommendations to resolve the "low priority toward PMT" includes:

Facilities - Renovate Yeaton Hall to provide compatible teaching environment for professional subjects. Include actual fleet equipment, i.e., LORAN-C,A, Radar, RDF, communications, etc., for hands-on training. Modern training aids for teaching rules-of-road and shiphandling. Adapt "T" boats for full utilization.

Time - Allocate sufficient additional time and emphasis to PMT training.

Summer Program - Establish a definite four-year plan for cadets encompassing fixed amounts of at-sea time with specific training objectives defined which must be met before a cadet can advance.

Large group at-sea training aboard the EAGLE and WHEC's limited to underclassmen. 1st classmen should be assigned individually to operational cutters in a junior officer capacity.

Saturday Morning Program - Formalize and structure the courses so that results can be measured. Coordinate courses with Nautical Science courses, especially NS/IV. Provide prime time for current "Saturday Morning" courses by switching labs, T-boats and/or elective courses to Saturday morning.

Operating Unit OJT - Clearly define and publish (to the field) the job-entry levels (capabilities) of a new graduate. Develop and publish a specific set of training requirements that the new Ensign is to receive after reporting for his first tour--this requires revision of CG-415.

E4.6 EVALUATION OF ACADEMY PROFESSIONAL TRAINING

Background

A Planning Proposal (Number 60-49-76) entitled, "Digital Navigation Simulator" from the Superintendent, USCG Academy to Commandant (G-CPE) recommends an eight-position radar navigation simulator for incorporation in the Nautical Science and Law Department. As stated therein, the device would be used to instruct cadets in the following: low visibility navigation, rules of road, collision avoidance, relative motion and maneuvering board solutions, formation steaming and tactical procedures, SAR, collision avoidance, etc.

The simulator would be used for instruction in Nautical Science I, III and IV. NSII is largely celestial navigation and, therefore, the course would remain unchanged. In I, III and IV, however, the simulator is proposed to replace from 96 to 192 hours of the existing schedule. That is, no expansion of the NS course hours allocation is contemplated.

It is contended that present methods of training, including routine classroom methods and some onboard training, do not provide sufficient exposure to give cadets an adequate knowledge of these techniques.

Finally, the Planning Proposal suggests that in order to comply with the Cadet training need categories, the simulator must be capable of providing the following specific requirements:

Collision Avoidance and Rules of Road

- Display and interpretation of true motion
- Display and interpretation of relative motion
- Presentation of rules of road steering situations
- Exercises in evaluating/determining courses of action in all phases of rules of road steering situations

Fog Navigation

- Radar scope reading and interpretation
- Reading, plotting and evaluation of radar information to fix position
- Familiarization with navigation into various harbors

Search and Rescue

- Exercises in conducting planned search, single and multi-unit
- Combined exercises (Fog, Nav, Rules of Road and Search and Rescue)

Basic Bridge Familiarization

- Familiarization with bridge routine
- Familiarization with bridge equipment and command

The following paragraphs review the current program in light of these recommendations.

E4.7 USCG ACADEMY NAUTICAL SCIENCE COURSE

The following table lists the subject material, covered in various Nautical Science classes and labs that could be amenable to demonstration/simulation. As shown, the total of all such material presentation hours is 77.

Classes

6. Maneuvering Board Computer Game
21. Magnetic Compass, Gyro Compass
35. Electronic Navigation
37. RDF, ADF
38. Loran A, Loran C
39. Decca, Consol
40. Omega

7 Hours

Labs

1&2. DRM, SRM, CPA, C/S
3. Course and Speed Changes
4. Stationing, Intercept
5. Relative Motion Composite
7. Dead Reckoning, Compass
8. Fix, Running Fix, Estimated Position
9. Piloting Composite
12. Electronic Navigation
13. Piloting Composite

20 hours

Nautical Science III

Labs

1. T-Boats, Introduction Unmooring
2. Man Overboard
3. Anchoring
4. Towing
5. Piloting
6&7. Mooring

17.5 hours

Nautical Science IV

Labs

1&2. Maneuvering Board
3. Piloting Review
4. Navigation Project
5. Navigation Techniques/Piloting
6. Radar Piloting/Advanced Techniques
8,9,10. Celestial & Electronic Nav
11,12. SPCM
13. SAR Piloting

32.5 hours

TOTAL HOURS: 77 hours

AD-A056 766 APPLIED DIGITAL COMMUNICATIONS MOORESTOWN NJ F/G 13/10
A STUDY TO DETERMINE THOSE AREAS IN WHICH VESSEL SIMULATION MAY--ETC(U)
APR 77 D W HANNA, E W BOYLE, J F DESPANTZ DOT-CG-61814A

UNCLASSIFIED 3M080 USCG-C-1-77 NL

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Thus, the proposal to incorporate Digital Simulation Techniques within the Nautical Science curriculum would, at best, only satisfy the foregoing Cadet training requirements.

As indicated, N/S I is an introductory course in the fundamentals of marine navigation. There are 7 class hours and 20 lab hours whose subject material could be demonstrated/simulated. However, because these students are four years from graduation and the material coverage is introductory, incorporation of a simulator capable of collision avoidance scenarios, fog navigation, search and rescue, etc., is beyond the scope of the N/S I curriculum and the capabilities of the students. The recommendation to incorporate fleet equipment and upgrade facilities at Yeaton Hall would provide adequate N/S I course support.

N/S II is fundamentally a celestial navigation course and has not been proposed for application to simulation techniques. No changes in the content or presentation of this material is proposed.

N/S III covers practical, hands-on seamanship training aboard T-boats which, upon modification to incorporate navigation equipment, appropriate repeaters and training facilities would significantly increase the utilization and training capability of these boats.

N/S IV course provides 32.5 hours of laboratory work part of which is a review of N/S I and II. These provide the basis for presentation of advanced techniques and coverage of new subject material such as SAR Piloting. The objective of these lab periods is to apply knowledge already learned to solve practical shipboard problems, while the N/S IV classes emphasize shipboard organizational aspects and junior officer responsibilities. The PMT Committee questionnaire concluded that these latter aspects should be emphasized, i.e., Coast Guard unit organization and administration. Thus, although simulation training covering collision avoidance, fog nav, etc., might be implemented for N/S IV laboratory periods, it could hardly be cost effective for the 32.5 hours scheduled. Further, seamanship/navigation inexperience was not the primary cadet shortcoming according to the CO/XO/EO's polled in the questionnaire. This could be due to the fact that the primary assignment of Academy graduates (DWO, Comm. CMS) did not require a high level of proficiency in such areas.

E4.8 T-BOAT TRAINING COST ANALYSIS

Table E4-1 presents an analysis of the operational training costs incurred during NS-III T-boat exercises. The analysis assumes that all four T-boats are ready and utilized for training and an average of 11 cadets are trained per boat. Cost element Q is the cost per cadet hour aboard based on the approach that all hours are "training" hours. Element R is the hourly cadet training cost assuming that actual training is achieved during hands-on time only.

The last part of this table repeats a portion of the cost analysis with the assumption that all T-Boat modifications suggested by the Academy, and listed in Table E4-2, are incorporated and that this results in full training utilization of the cadets. That is, each receives a full 17.5 hours of actual, hands-on training due to the additional stations created by the various equipments.

TABLE E4-1. COAST GUARD ACADEMY - NAUTICAL SCIENCE OPERATIONAL TRAINING COST - T-BOATS

Element	Factor	Remarks
A. Number of T-Boats (units) assigned to Training	4	
B. Hours of actual underway training per curriculum	17.5 hours	Assuming 4 active positions: conn, helm, pilot/nav and observer x 17.5= 70 active position hours ÷ E = 6.36 hours per student or, 1.6 hrs. per position.
B_1. Average actual hands-on time per student	6.4 hours	
C. Average number of students in Nautical Science III	220	
D. Average number of students trained per underway session	44	
E. Average number of students trained per T-Boat	11	D ÷ A
F. Number of training sessions per boat	5	C ÷ D
G. Total underway training time for N/S III	350 hours	A x B x F
H. Total underway training time per T-Boat	87.5 hours	G ÷ A
I. Total fuel/maintenance cost for N/S III training	Fuel @ $ 7,000	Assume $20/hr. fuel, lubrication cost per USCG Academy records
	Maint.} Mat'l 16,716 Labor 21,837	2796 hrs. per USCG Academy records-assuming all enlisted at 13K + 25% per annum ÷ 2080 = 7.81/hr.
	TOTAL $45,553	
J. Annual instructor/crew costs for underway training	$5,453	One officer (instructor) @ 27K + 20% = 32.4 K per year ÷ 2080 = $15.58/hr x G
K. Instructor/crew costs per T-Boat	$1,363	J ÷ A
L. Annual depreciation per boat	$2,500	25K re-engine cost over 10 years

TABLE E4-1. COAST GUARD ACADEMY - NAUTICAL SCIENCE OPERATIONAL TRAING COST (continued)

Element	Factor	Remarks
M. Total depreciation/annum	$10,000	L x A
N. Total cost for N/S III training	$61,006	I + J + M
O. Total cost of T-Boat underway training per hour	$174	N ÷ G
P. Total underway training man hours	3850 M/H	B x C
Q. Total cost of underway training per man hour	$15.85	N ÷ P
R. Total cost of underway training per actual hands-on man hours	43.33	N ÷ (B_1 x C)
TRAINING COSTS ASSUMING FULL MODIFICATION OF T-BOATS		
L_1. Annual depreciation per boat	$ 7,925	$317K for 4 boats over ten years
M_1. Total depreciation/annum	$31,700	L_1 x A
N_1. Total cost for N/S III training	$82,706	I + J + M_1
O_1. Total cost of T-Boat underway training per hour	$236	N_1 ÷ G
P_1. Total underway training man hours	3,850 M/H	B x C
Q_1. Total cost of underway training per man hour	$21.48	N_1 ÷ P_1
R_1. Total cost of underway training per actual hands-on man hour	$21.48*	N_1 ÷ (B x C)

* Based on the assumption that the indicated modifications lead to full hands-on training for each cadet for 17.5 hours.

TABLE E4-2. RECOMMENDED MODIFICATIONS TO T-BOATS

Purpose: To provide the Academy with necessary training vessels for practical training in shiphandling, piloting, fog navigation, use of electronic navigation equipment and visual signaling equipment. This list is based upon the study in training aids deficiencies performed by the Department of Nautical Science and Law.

Modification	Unit Cost	Total Cost	Status
Re-engine	25K	100K	Completed
Install Anchor Windlass	3K	12K	Completed
Radar and Plotting Stations	30.25K	121K	Pending
Install Boom	.25K	1K	Pending
Install Gyro Compass	8.5K	34K	Pending
Install 3 Gyro Repeaters	3K	12K	Pending
Convert Mess Deck	1K	4K	Pending
Install ROF Equipment	1K	4K	Pending
Install LORAN A and C	2.5K	10K	Pending
Install Omega	3.75K	15K	Pending
Install Signal Lights	.5K	2K	Pending
Install Flag Bags	.5K	2K	Pending
Total Modification Cost	79.25K	317K	

Estimated Cost to Modify 4 T-Boats $317,000

Estimated life of modified boats 10 years

Cost per year (4 T-Boats) $31,700

Cost per year per T-Boat $7,925

E4.9 CADET SUMMER PRACTICE SQUADRON CRUISES

These are performed to provide a controlled environment in which the cadet can learn and apply professional skills under a structured system of evaluation to determine his fitness and suitability for commissioning as an officer.

Overall objectives of the cutter summer program fall into four general categories: (1) evaluation, (2) training, (3) familiarization, and (4) social and cultural attributes. Specific objectives for each class are summarized below.

4/C Summer Cruise - Provide an introduction to the sea and shipboard routine.

3/C Summer Cruise - Provide an in-depth familiarization and training.

2/C Summer Cruise - Provide an emphasis in broadening a cadet's perspective of the diversity of the Service's missions. Cutter time is minimal.

1/C Summer Cruise - Provide a dedicated environment for the cadet to learn, apply and demonstrate professional skills and knowledge.

E4.9.1 Summary of Summer Cruise Assessment - PMT Committee Report

Based on responses to the PMT committee's questionnaire, the Academy's "Most Helpful Course" was cadet cruising based on the experience gained. In general, the majority feeling was that the smaller the group of cadets assigned to an individual unit, the more beneficial the program.

A majority of junior officers, asked to recommend improvements to better prepare a graduate for his first assignment, cited the following:

(a) More sea duty including cutters vice EAGLE for 1/C cadets.

(b) More practical experience (OJT).

(c) Assign cadets in small groups for summer programs.

Under the PMT Committee's Causes and Recommendations, the following comments on the Summer Cruise Program were made:

Cause - The Summer Program is inconsistent, not systematic and has insufficient resources to support it. There is a wide variance from year to year, cadet to cadet, cruise durations, type of training, vessels assigned and training objectives.

Recommendation - The Summer Program should be established with a definite four year plan. A particular summer class should undergo uniform training, with a fixed amount of at-sea time and specific training objectives defined that each cadet must meet before he can advance.

The Committee recommends that the at-sea training in large groups aboard EAGLE and WHEC's be directed at underclassmen. Further, at-sea training for 1st Class summer should be carried out by assigning 1/C Cadets individually to operational cutters to serve in a junior officer capacity.

Table E4-3 provides a cost analysis of cadet summer cruises for third class and first class cadets. The number of cadets and cruise duration (itinerary) are based on 1976 estimates.

TABLE E4-3. CADET SUMMER CRUISE

Element	Factor		Remarks
	PACAREA	LANTAREA	
A. Cadets to be trained	120	185	Total 305 per G-000/74 letter; 4 March 1976
B. Total underway hours per cutter	1195	1240	Per OPORDER 3-76 Cruise itinerary
C. Number of cutters assigned	2	3	WHEC's (PAC: 1-378', 1-327'; LANT: 1-378', 2-327')
D. Average cadets per cutter	60	62	55 per 378' and 65 per 327'
E. Total hours per squadron	2390	3720	B x C
F. Total cadet - cruise man hours	143,400	229,400	A x B
G. Cutter operating cost per hour	$809	$809	Based on 180 day operating year @ $2.16M plus 7.4K depreciation/day
H. Cost per cadet - cruise man hour	$13.48	$13.12	G x E ÷ F
I. Total cruise cost per cadet	$16,109	$16,269	B x H
J. Total cruise days per cutter	49.8	51.7	B ÷ 24 hours
K. Average daily watch-standing experience per cadet	6 hrs	6 hrs	Assume that nominally, cadets stand a 1 in 4 watch, i.e., 12 hours every 2 days
L. Total hours on watch per cadet	298.8	310.2	J x K
M. Cruise cost per cadet watch-hour	$54	$52	I ÷ L

E5.0 OPERATIONAL TRAINING

E5.1 DEFINITION OF CATEGORIES

A. Area Training Teams

These training teams provide operational training assistance to district units. They are employed primarily for the benefit of small cutters (<157') which do not undergo refresher training.

The general types of training assistance provided are: Gunnery, Damage Control, Search and Rescue, NBC Warfare Defense, Low Visibility Piloting, First Aid and Emergency Drills. Five days training is required to cover all subjects.

B. Ship Training Detachments

Provides CIC-type training in the various districts using a specially-equipped trailer. The trailer is equipped with appropriate communication facilities and simulation devices which achieve realism in the training situation. The special configuration of the trailer enables CIC-related training in the following subjects:

Maneuvering Board Problems	Plane Ditch Drill
Radar Navigation	DRT Operation and Use
Multiple Surface Contacts	CIC Casualty Procedures
GQ Plotting Drill	Allied Naval Signal Book
Nudet Procedures	Oceanic Datum Point
R/T Procedures	POD/Sweep Width/Track Space
High Speed Air Plotting	Minimax Plot
Station Taking Drill	Search Patterns
GQ Problem (Mock Up)	ATC Procedures
CSR Search Pattern	SAR Problem (Mock Up)
	Rules of Road

This training is normally limited to WHEC's, WMEC's and WAGB's.

C. ASW Training

The CO, XO, ASW Officer and Support Personnel of ASW-equipped cutters receive ASW training appropriate to their duties at Atlantic Fleet schools.

D. Mobile Technical Units (MOTU)

MOTU's are teams of Navy military and civilian personnel who provide technical expertise and OJT to assist ships personnel in the following areas: Fire Control Systems, Ordnance, Sonar, ECM, Radar/IFF, LORAN, Communications, TACAN.

E. Training Availability

This is an integral part of a unit's training program which utilizes shore-based Navy schools for training both officers and enlisted men. Training Availability is typically scheduled for all WHEC (except 378' class) and WMEC cutters about midway between successive refresher trainings or immediately prior to REFTRA. It is the responsibility of the CO to ensure maximum use of this training. Scheduling of 378' class WHEC's is at the discretion of their districts.

Training Availability for COMLANTAREA units is conducted at the Norfolk, Virginia, or Charleston, S.C., Naval Fleet Training Centers.

F. Shakedown and Refresher Training

This training is conducted at U. S. Navy underway training facilities: Fleet Training Group, Guantanamo Bay, Cuba (FLETRAGRU GTMO) or Underway Training Group, Norfolk, Virginia (UWAYTU NORVA).

Shakedown Training - Purpose is to aid newly commissioned cutters in becoming fully operational. The length of shakedown training will be:

WHEC	5 weeks
WAGB	4 weeks
WMEC	3 weeks
WLB	3 weeks

Refresher Training - Schedule - 378' WHEC's - 4 weeks at FLETRAGRU GTMO on a 12-month basis. Other WHEC's - 3 weeks at FLETRAGRU GTMO on an 18-month cycle. Medium Class Cutters - (210' WMEC's, ocean-going tugs and sea-going buoy tenders 180' and other) are scheduled for a 2-week period at UTU NORVA or FTG GTMO on a 12 to 24-month cycle. Polar Icebreakers - 3 weeks at UTU NORVA or FLETRAGRU GTMO on an 18 to 24-month cycle. Other Cutters (WAGO's, WTR's) may be scheduled for a 2-week period at UTU NORVA as their employment schedule permits.

Prior to scheduled refresher training period, COMTRALANT furnishes a cutter with Training Readiness Check Lists and the designated Navy training facility furnishes other material.

UWAYTU NORVA provides Limited Team Training (LTT) which is REFTRA style training, for which no report is submitted, to ships in the Norfolk-Little Creek area. This training is limited to one or more areas (i.e., damage control, CIC, etc.) for one or more days. LTT cannot be used for pre-refresher training.

G. Drills and Exercises

Joint Operational Exercises - Whenever possible, Coast Guard units participate in joint operational exercises with the Navy. It is anticipated that each 378' WHEC will be scheduled for one Navy ASW exercise per year.

Search and Rescue Exercises - The SAR Training and Standardization Manual establishes the guidance for conducting SAR exercises and promotes uniformity in procedures and phraseology among all units. SAR exercise schedules and minimum frequency is specified by cognizant District Commanders and shall be sufficient to assure the capability of a unit to participate in a SAR mission with professional competence at any time.

Multi-Unit Exercises - These require the participation of more than one unit such as two cutters, a cutter and an aircraft, a cutter and a submarine.

Other than refresher training periods, the relief of Ocean Weather Station offers the most convenient opportunity for conducting multi-unit exercises by WHEC's.

As the opportunity arises, Commander, Atlantic Area, schedules exercises with transiting submarines and service force vessels. Exercises between HEC's are selected from FXP-3 along with certain "J" series exercises. Time for relief of Ocean Weather Station is set for not later than 1600 Z for the purpose of facilitating "in company" multi-unit exercises during daylight hours. Therefore, cutters remain in company for at least two hours.

H. ASWEX Exercises

ASW Fleet Exercises for Hamilton Class Cutters (378) - Each ship participates annually in Navy ASW exercises which average 19 days in length.

I. Training Afloat (OJT)

On-the-job training is tailored for each ship using the lesson plans from the Unit Training Manuals to provide some standardization between ships. The development of cost for the exercise of this training effort is difficult at best. The general assumption is that this training is done as required utilizing personnel time which cannot be applied elsewhere.

E5.2 ANALYSIS OF SCHEDULED OPERATIONAL TRAINING CATEGORIES

E5.2.1 Area Training Teams

A. Atlantic Area

The Atlantic Area training team is authorized 28 officers and men which are organized into the following specialized teams:

(a) 4 Mobility Teams

(b) 2 Law Enforcement Teams

(c) 1 SAR Team

The Atlantic Area Ship Training Detachment (STD 4) is authorized one officer and two enlisted personnel.

B. Pacific Area

The Pacific Area training team is authorized eleven officers and men which are organized into the following specialized teams:

(a) 1 Cutter Training Detachment

(b) 1 Shore Unit Training Detachment

The Pacific Area Ship Training Detachment (STD 5) is authorized one officer and three enlisted personnel.

E5.2.1.1 Training Team Coverage

In general, training team and STD personnel operate approximately 35 weeks per year and spend one week at each location. Therefore, each training team or detachment trains a standard 35 units per year for approximately 4.5 training days/unit. Certain teams achieve a higher rate since it is possible to train more than one unit simultaneously. Thus, the Atlantic Area's STD 4 and the Pacific Area's Cutter Training Detachment each train approximately 45 units annually.

The standard 4.5 days allocated per location is fairly constant, usually running Monday through one-half day Friday, thus providing 32 hours of actual instruction. Travel between unit locations is usually accomplished on weekends beginning on Friday. Therefore, two and one-half days are allocated to travel resulting in a total training allocation of seven days (4-1/2 days' training, 2-1/2 days' travel) per unit. Units which tow a trailer, such as the STD's, spend an additional four weeks in long distance travel.

E5.2.1.2 Student Coverage

The number of students trained per unit varies considerably, depending upon the unit and type of training required. Massed lectures

typically handle twenty-five students, while highly specialized training covers only about six students/class. Normally the class size averages about fifteen.

E5.2.1.3 Operating Costs

The operating cost of mobile training resources is relatively constant at 15K per man year and includes travel, per diem, minor training aids, housekeeping and repairs.

E5.2.1.4 Training Team Cost Analysis

Tables E5-1 through E5-7 provide a cost analysis, in accordance with the foregoing factors, for each of the following operational team training categories:

- Table E5-1. Atlantic Area Mobile Teams
- Table E5-2. Atlantic Area Law Enforcement Teams
- Table E5-3. Atlantic Area SAR Team
- Table E5-4. Atlantic Area STD 4
- Table E5-5. Pacific Area Cutter Training Detachment
- Table E5-6. Pacific Area Shore Unit Training Detachment
- Table E5-7. Pacific Area STD 5

Cost data analysis for both Atlantic and Pacific teams are based upon a standard seven-day training allocation per unit (4.5 days training + 2.5 transit), $15,000 operating cost per man and an average fifteen students per session with 32 hours of actual instruction. Variable factors are the number of units trained/year, number of authorized personnel/team and their direct salaries.

As shown in the tables, the Atlantic Area team man hour training cost is $6.76 for Mobility teams, $7.92 for Law Enforcement and $12.12 for the SAR team. The Atlantic STD 4 man hour training cost is $5.09. Pacific Area man hour training cost figures are: $9.43 for Cutter Training, $10.26 for Shore Unit Training and $8.40 for the Pacific STD 5. These costs reflect the ratio of training personnel to the number of students trained. STD 4 covers 45 units (675 students) with three personnel for the least man hour training cost of $5.09. The Atlantic SAR team, on the other hand, covers only 35 units (525 students) with six personnel for the highest man hour training cost of $12.12.

TABLE E5-1. ATLANTIC AREA MOBILE TEAMS

Element	Factor	Remarks
<u>Atlantic Area Training Team - 4 Mobility Teams</u>		
A. Units trained per year	140	(35 individual units/team)
B. Number of personnel assigned	14	
C. Operating cost per man year	$15K	
D. Total Operating Cost	$210K	B x C
E. Direct salaries per annum	$244K	
F. Total operating and personnel cost	$454K	D + E
G. Average training days allocated per unit	4.5 days	
H. Average transit time per unit training session	2.5 days	
I. Total days allocated to training each unit	7.0 days	G + H
J. Total days allocated to training per year	980 days	A x I
K. Cost per allocated training day	$463	F ÷ J
L. Average number of students trained per unit	15	
M. Total students trained per year	2100	A x L
N. Average cost per student	$216	F ÷ M
O. Average cost per student training day	$48	N ÷ G
P. Average actual hours of training provided per unit	32 hours	
Q. Total actual training man hours per year	67,200	M x P
R. Average actual cost per training man hour	6.76	F ÷ Q

TABLE E5-2. ATLANTIC AREA LAW ENFORCEMENT TEAMS

Element	Factor	Remarks
Atlantic Area Training Team 2 Law Enforcement Teams		
A. Units trained per year	70	(35 individual units/ team)
B. Number of personnel assigned	8	
C. Operating cost per man year	$15K	
D. Total operating cost	$120K	B x C
E. Direct salaries per annum	$146K	
F. Total operating and personnel cost	$266K	D + E
G. Average training days allocated per unit	4.5 days	
H. Average transit time per unit training session	2.5 days	
I. Total days allocated to training each unit	7.0 days	G + H
J. Total days allocated to training per year	490 days	A x I
K. Cost per allocated training day	$543	F ÷ J
L. Average number of students trained per unit	15	
M. Total students trained per year	1050	A x L
N. Average cost per student	$253	F ÷ M
O. Average cost per student training day	$56	N ÷ G
P. Average actual hours of training provided per unit	32 hrs.	
Q. Total actual training man hours per year	33,600	M x P
R. Average actual cost per training man hour	$7.92	F ÷ Q

TABLE E5-3. ATLANTIC AREA SAR TEAM

Element	Factor	Remarks
Atlantic Area Training Team 1 SAR Team		
A. Units trained per year	35	
B. Number of personnel assigned	6	
C. Operating cost per man year	$15K	
D. Total operating cost	$90K	B x C
E. Direct salaries per annum	113.6K	
F. Total operating and personnel cost	$203.6K	D + E
G. Average training days allocated per unit	4.5 days	
H. Average transit time per unit training session	2.5 days	
I. Total days allocated to training each unit	7.0 days	G + H
J. Total days allocated to training per year	245 days	A x I
K. Cost per allocated training day	$831	F ÷ J
L. Average number of students trained per unit	15	
M. Total students trained per year	525	A x L
N. Average cost per student	$388	F ÷ M
O. Average cost per student training day	$86	N ÷ G
P. Average actual hours of training provided per unit	32 hours	
Q. Total actual training man hours per year	16,800	M x P
R. Average actual cost per training man hour	$12.12	F ÷ Q

TABLE E5-4. ATLANTIC AREA STD4

Element	Factor	Remarks
Atlantic Area STD 4		
A. Units trained per year	45	
B. Number of personnel assigned	3	
C. Operating cost per man year	15K	
D. Total operating cost	45K	B x C
E. Direct salaries per annum	65K	
F. Total operating and personnel cost	110K	D + E
G. Average training days allocated per unit	4.5	
H. Average annual transit time	141	2.5 days per unit + 4 wks (28 days)
I. Total days allocated to training all units	344 days	(A x G) + H
J. Average number of students trained/ unit	15	
K. Cost per allocated training day	$320	F ÷ I
L. Total students trained per year	675	A x J
M. Average cost per student	$163	F ÷ L
N. Average actual hours of training per unit	32 hrs	
O. Total actual training man hours per unit	21,600	N x L
P. Average actual cost per training man hour	$5.09	F ÷ O

TABLE E5-5. PACIFIC AREA CUTTER TRAINING DETACHMENT

Element	Factor	Remarks
Pacific Area Training Team 1 Cutter Training Detachment		
A. Units trained per year	45	
B. Number of personnel assigned	6	
C. Operating cost per man year	$15K	
D. Total operating cost	$90K	B x C
E. Direct salaries per annum	$113.7K	
F. Total operating and personnel cost	$203.7K	
G. Average training days allocated per unit	4.5 days	
H. Average transit time per unit training session	2.5 days	
I. Total days allocated to training each unit	7.0 days	G + H
J. Total days allocated to training per year	315 days	A x I
K. Cost per allocated *training* day	$647	F ÷ J
L. Average number of students trained per unit	15	
M. Total students trained per year	675	A x L
N. Average cost per student	$302	F ÷ M
O. Average cost per student training day	$67	N ÷ G
P. Average actual hours of training provided per unit	32 hours	
Q. Total actual training man hours	21,600	M x P
R. Average actual cost per training man hour	$9.43	F ÷ Q

TABLE E5-6. PACIFIC AREA SHORE UNIT TRAINING DETACHMENT

Element	Factor	Remarks
Pacific Area Training Team (cont'd) 1 Shore Unit Training Detachment		
A. Units trained per year	35	
B. Number of Personnel assigned	5	
C. Operating cost per man year	$15K	
D. Total operating cost	75K	B x C
E. Direct salaries per annum	$97.4K	
F. Total operating and personnel cost	$172.4K	
G. Average training days allocated per unit	4.5 days	
H. Average transit time per unit training session	2.5 days	
I. Total dyas allocated to training each unit	7.0 days	G + M
J. Total days allocated to training per year	245 days	A x I
K. Cost per allocated training day	$704	F ÷ J
L. Average number of students trained per unit	15	
M. Total students trained per year	525	A x L
N. Average cost per student	$328	F ÷ M
O. Average cost per student training day	$73	N ÷ G
P. Average actual hours of training provided per unit	32 hours	
Q. Total actual training man/hours	16,800	M x P
R. Average actual cost per training man hour	$10.26	F ÷ Q

TABLE E5-7. PACIFIC AREA STD5

Element	Factor	Remarks
<u>Pacific Area STD5</u>		
A. Units trained per year	35	
B. Number of personnel assigned	4	
C. Operating cost per man year	15K	
D. Total operating cost	60K	B x C
E. Direct salaries per annum	81.2K	
F. Total operating and personnel cost	141.2K	D + C
G. Average training days allocated per unit	4.5 days	
H. Average annual transit time	116 days	2.5 days per unit + 4 wks long distance travel (28 days)
I. Total days allocated to training all units	274 days	(A x G) + H
J. Average number of students trained/unit	15	
K. Cost per allocated training day	$515	F ÷ I
L. Total students per year	525	A x J
M. Average cost per student	$269	F ÷ L
N. Average actual hours of training per unit	32 hours	
O. Total actual training man hours per year	16,800	L x N
P. Average actual cost per training man hour	$8.40	F ÷ O

E5.3 TRAINING AVAILABILITY

Table E5-8 lists those formal courses generally available to G-OMR via Training Availability and which are in accordance with COMDTINST 1540.3A. The course description and duration are given along with the location of the school and cutter class applicability.

The cutter classes shown encompass 14 specific cutter types as follows:

WHEC: 378, 327, 255

WAGB: 310, 290, 269

WMEC: 230, 213, 210, 205, 143

WAGO: 213, 180

WLB: 180

The training allocation of each indicated cutter's personnel is given for each applicable cutter class, i.e., 3/378 sets forth a training standard requiring three personnel from each 378 to be trained in the course.

Table E5-9 lists additional COMDTINST 1540.3A courses available to G-OMR but which are not usually conducted via Training Availability due to their long duration (in excess of two weeks).

Table E5-10 develops operating costs for each of the vessels covered in Table E5-8. Actual FY74 operating costs are brought forward to FY76 by application of a 20% escalation factor. These costs are used to determine costs per man day of training which is derived by assuming that one-half the crew is undergoing training each day and that five days of training requires a total commitment, due to transit time, etc., of seven days, e.g., Monday through Friday plus Saturday and Sunday. Thus, the total operating cost of the cutter for seven days is allocated to the total training man-days accumulated in five consecutive calendar days to derive a training cost per man/day. Table E5-11 uses this cost to price appropriate Training Availability courses for each cutter type. Obviously, these costs are not cumulative since they simply represent the allocation of operating costs to those training courses applicable to a particular cutter, and cannot, therefore, exceed the daily operating cost of the cutter. The training course costs, rather, represent relative magnitudes of the investment of cutter time.

Actual, direct costs for Training Availability are minimal. Since training is furnished by the Navy, direct costs incurred are simply those that are unique to supporting the vessel at the FTC activity. These include: transit to the FTC, fuel cost, dockage fees and vehicle transportation. Table E5-12 provides derivation of these direct costs for vessels attending Training Availability. As indicated, the cost per man day of training for each vessel type is: WHEC's =

$3.95, WMEC's = $9.43, WLB/WAGO = $10.39, and WAGB's = $10.76. These costs are insignificant in comparison with the operating cost allocation shown in Table E5-10. In any case, training availability benefits may be maximized by proper advanced scheduling to achieve the highest number of quotas available and the maximum number of courses taken consistent with personnel considerations and operational requirements.

E5.4 REFRESHER TRAINING

Refresher Training, which is intended to enhance the mobility of the unit, is the final authentication of unit training. Its successful completion indicates that a unit is fully ready for unrestricted independent operations. Refresher training of Coast Guard ships is conducted by the Navy using Navy facilities. Table E5-13 provides a cost analysis of Refresher Training for five major classes of vessels. The fundamental assumption in deriving these cost data is that all crew members receive a full day's training for each day the vessel is undergoing Refresher Training. That is, for a crew complement of 100, each day of REFTRA converts to 100 man days of training. Obviously, few exercises involve the entire crew and, therefore, this approach oversestimates the efficiency of Refresher Training, and the costs per training-man-day given in S and T of the table are optimistically low. Any decrease below the 100 percent level of crewmen trained per day would cause a proportional increase in costs, i.e., if just half (77) of the WHEC crew actually received training on an average REFTRA day, the total cost per training man-day doubles to $398. Thus, this is the most costly type of training provided to vessle crew teams, on a direct cost basis, even if 100 percent daily crew participation is assumed. This is to be expected since this training involves cutter operation and, therefore, is probably the most beneficial.

TABLE E5-8. TRAINING AVAILABILITY COURSES PER COMDTINST 1540.3A SUPPORTING G-OMR

Course Description	Duration	Location	WHEC	WAGB	WMEC	WAGO	WLB
A. Damage Control							
1. Basic Damage Control, K-00/780-2089	5 days	FTC Long Beach, FTC Newport, FTC Norfolk, FTC Charleston, FTC Mayport	All repair party personnel				
2. Basic Shipboard Firefighting K-00/780-2016	2 days	NTC San Diego, FTG Pearl Harbor, FTC Newport, FTC Norfolk, FTC Charleston, FTC Mayport	All watch officers and 30% of crew				
3. Fire Fighting, Shipboard, Indoctrination/Refresher J-780-412X	2 days	FTC Newport, FTC Norfolk, FTC Charleston	30% of crew				
4. Damage Control Firefighting, Shipboard, J-4G-406X	1 week	FTC Newport, FTC Norfolk, FTC Charleston, FTC Mayport	All repair party personnel				
5. Damage Control Plastic Repair, A-780-0028,0029	2 days	Naval Schools, Treasure Island, Training Center, Philadelphia, Pennsylvania	One per repair party				
6. Damage Control Team Training, K-780-2032	1 day	NTC San Diego, FTG Pearl Harbor, FTC Newport, FTC Norfolk, FTC Charleston, FTC Mayport	All repair party personnel				
7a. Fire Fighting, Shipboard Aircraft, J-7K-780-413X	2-1/2 days	FTC Newport, FTC Norfolk, FTC Mayport	3/378	3/310 3/269	3/210		
7b. Fire Fighting, Shipboard Aircraft, K-780-2018	1 week	NTC San Diego	3/378	3/310 3/269	3/210		
8. Fire Pump Repair Portable P-250, A-780-0026,0027	2 days	Training Center, Phila. Naval School, Treasure Island, California	One per repair party				

TABLE E5-8. (continued)

Course Description	Duration	Location	WHEC	WAGB	WMEC	WAGO	WLB
B. Team Training							
1. CIC Team Training J-2G/221-310X, J-2G-0018	1 week	NTC San Diego, FTC Pearl Harbor, FTC Newport, FTC Norfolk, FTC Charleston	CIC Team				
2. GSCS MK56 Operation K-113-136X, J-2E/041-110X	1 week	NTC San Diego, FTC Newport, TRaining Center Dam Neck	MK56 Team				
3. Gun Operation 5"/38 Cal. J-041-125X, J-000-2054	1 week	NTC San Diego, FTC Newport, Training Center Dam Neck	5"/38 Gun Crew all WHEC's				
4. Surface Ship ASW Training J-2G/210-5112, J-000-1032	1 day	NTC San Diego, FTC Long Beach, FTG Pearl Harbor, FTC Newport, FTC Norfolk, FTC Charleston	ASW, & CIC Teams				
C. ASW Training							
1a. Anti-Sub Air Control (Refresher) K-2G-1015	1 day	NTC San Diego	2/378				
1b. Anti-Sub Air Control (Refresher) J-2G/221-326X	3 days	FTC Newport, FTC Charleston FTC Mayport, Training Center Dam Neck	2/378				
2. ASW Environment Refresher J-1B-557X	1 week	FTC Norfolk	1/378				
3. ASW Operations J-2G-554X	2 weeks	FTC Norfolk	2/378				
4. Command Course in Coordinated ASW K-2E-1039	2 weeks	NTC San Diego	2/378				
5. Operations Course in Coordinated ASW/LAMPS K-2E-1038	10 days	NTC San Diego	1/378				
6. Sonar Contact Classification J-2G/210-561X,K-00-1004	5 days	NTC San Diego, FTC Newport, FTC Norfolk, FTC Charleston	7/378				

TABLE E5-8 (continued)

Course Description	Duration	Location	WHEC	WAGB	WMEC	WAGO	WLB
D. CIC							
1. AAW Electronic Warfare for Senior Officers J-2G-345X	1 week	Training Center, Dam Neck	1/378				
2. AAW Warfare Overview K-2G-0032	5 days	NTC San Diego	1/378				
3. CIC Procedures J-2G-221-305X	2 weeks	FTC Newport, Training Center Dam Neck, FTC Charleston, FTC Mayport	1/378				
4. Electronic Warfare Equipment Operator (BASIC) J-233-200X, K-2G-0024/25	10 days	NTC San Diego, FTG Pearl Harbor, FTC Newport, FTC Norfolk, FTC Charleston, FTC Mayport	2/378				
5. Electronic Warfare Officer/ Supervisors K-2G-0013, J-2G/233-205X	10 days	NTC San Diego, FTG Pearl Harbor, FTC Newport, FTC Charleston, FTC Mayport	1/378				
6. NTDS-Link 14 Communications & Plotting Procedures J-2G-359X	1 day	Training Center Dam Neck	1/378				
7. Surface Electronic Warfare Officer J-2G-2101	2 weeks	Training Center Dam Neck	1/378				
E. General							
1. Shipboard Helo Operational Procedures for Icebreaker	3 days	Sub Training School New London		1/310 1/269			
2. Landing Signal Officer CGAS-OJT	2 days	OJT	1/378	1/310 1/269	1/210		
3. Military Justice - Senior Officer A-5F-0011	1 week	FTC Newport	One per cutter type				
4. NBC Defense J-2G-780-420X	2 weeks	NTC Newport, FTC Norfolk, FTC Charleston, FTC Mayport	4 per cutter type		3 per cutter type		

TABLE E5-8 (continued)

Course Description	Duration	Location	WHEC	WAGB	WMEC	WAGO	WLB
5. Basic NBC Defense K-00-2036	4 days	FTC Long Beach	4 per cutter type		3 per cutter type		
6. Rules of the Nautical Road K-00/000-2109	2 days	FTG Pearl Harbor	All underway OOD's - Each cutter type				
7. Rules of Road Shiphandling (Refresher) J-2G-6042	1 week	FTC Norfolk	Two per cutter type				
8. Torpedo MK44/46 & AWTT MK32 K-123-568X	1 week	FTG Pearl Harbor, FTC Newport, FTC Norfolk	3/378				
9. Gunnery Petty Officer J-041-1022	2 weeks	Training Center Dam Neck	2/378 2/327 2/255				

TABLE E5-9. ADDITIONAL COMDTINST 1540.3A COURSES SUPPORTING G-OMR

Course Description	Duration	Location	WHEC	WAGB	WMEC	WAGO	WLB
1. ASW Officer J-2G-536X, K-2E-1044	8 weeks	FTC Newport, NTC San Diego	1/378				
2. ASW Watch Officer J-2G-0540, K-00-1011	3 weeks	FTC Newport, NTC San Diego	2/378				
3a. CIC Watch Officer, Mod I J-02G-0322	3 weeks	Training Center Dam Neck, NTC San Diego	1/378				
3b. CIC Watch Officer, Mod II J-02G-0235	3 weeks	Training Center Dam Neck, NTC San Diego	1/378				
4. Surface Electronic Warfare Officer K-2G-0026	20 days	NTC San Diego	1/378				
5. Weapons Dept. Admin/Ops (PL.A&F) K-00-2009	9 days	NTC San Diego	1/378				
6. Gunner Officer J-2E-100X	4 weeks	Training Center Dam Neck	1/378				
7. FT Equipment	14 weeks	FTC Newport	3/378 2/327 2/255				
8. GM Equipment	8 weeks	FTC Newport	2/378 2/327 2/255	1/310 1/269	1/230 1/210 1/205		1
9. MK NC-2 Plotter Mod 2/2A Maint. A-623-0016,A-623-0015	4 weeks	FTC Norfolk, FTC San Diego	2/378				
10. Anti-Sub Air Control J-2G/ 221-3212, K-2G-1013	3 weeks	Training Center Dam Neck, NTC San Diego	2/378				
11a. Radar Signal Processing Equipment K-113-2033	20 days	NTC San Diego	2/378				
11b. Radar Signal Processing Equipment J-113-1112	7 weeks	Training Center Dam Neck	2/378				

TABLE E5-10. CUTTER OPERATING COSTS TRAINING AVAILABILITY

	Element	WHEC	WMEC	WLB/ WAGO	WAGB	Remarks
A.	Average annual operating cost of cutter	2.16M	936K	726K	2.35M	FY74 actuals + 20%
B.	Daily operating cost/cutter	12K	5.2K	4.033K	13.1K	A÷180 (Operating days per year)
C.	Depreciation per cutter operating day	7407	3333	2462	11.1K	
D.	Total cost per cutter operating day	19407	8533	6495	.24.2K	B+C
E.	Personnel allowance per cutter	154	68	52	160	
F.	Cost of man day of training	353	351	350	424	Dx7 (op. days)÷(E/2)x5 (training days), i.e., 50% of crew is trained each day for 5 days. Actual cutter commitment time is 7 days. For WHEC's, Operating days = 14, and training days = 10.

TABLE E5-11. TRAINING AVAILABILITY COURSE COST ALLOCATION

	Course Description/Loading	WHEC M/D	WHEC Cost*	WMEC M/D	WMEC Cost*	WLB/WAGO M/D	WLB/WAGO Cost*	WAGB M/D	WAGB Cost*
A1.	5 days x Repair Party Personnel	50	17,650	50	17,550	50	17,500	50	21,200
A2.	2 days x All Watch Officers	6	2,118	6	2,106	6	2,100	6	2,544
	2 days x 30% of crew	92	32,617	40.8	14,321	31	10,850	96	40,704
A3.	2 days x 30% of crew	92	32,617	40.8	14,321	31	10,850	96	40,704
A4.	5 days x Repair Party Personnel	50	17,650	50	17,550	50	17,500	50	21,200
A5.	2 days x One Man per Repair Party	6	2,118	6	2,106	6	2,100	6	2,544
A6.	1 day x Repair Party Personnel	10	3,530	10	3,510	10	3,500	10	4,240
A7a.	2.5 days	7.5	2,648	7.5	2,633			7.5	3,180
A7b.	5 days	15	5,295	15	5,265			15	6,360
A8.	2 days x One Man per Repair Party	6	2,118	6	2,106	6	2,100	6	2,544
B1.	5 days x CIC team	50	17,650						
B2.	5 days x MK56 team	50	17,650						
B3.	5 days x 5"/38 Gun Crew	50	17,650						
B4.	1 day x ASW and CIC teams	15	5,295						
C1a.	1 day x 2 ASAC's	2	706						
C1b.	3 days x 2 SASC's	6	2,108						
C2.	5 days x CO	5	1,765						
C3.	10 days x XO & Ops Officers	20	7,060						
C4.	10 days x CO & XO	20	7,060						
C5.	10 days x Ops Officer	10	3,530						
C6.	5 days x 7 ST's	35	12,355						
D1.	5 days x CO	5	1,765						
D2.	5 days x CO	5	1,765						
D3.	10 days x CIC Officer	10	3,530						
D4.	10 days x RD2 & RD3	20	7,060						
D5.	10 days x RDC/RD1	10	3,530						
D6.	1 day x RDC/RD1	1	353						
D7.	10 days x EW Officer	10	3,530						
E1.	3 days x PCO	0	0					3	1,272
E2.	2 days x LTJG/ENS	2	706	2	702			2	848
E3.	5 days x CO	5	1,765	5	1,755			5	2,120
E4.	10 days x 2 Petty Off/Dept	40	14,120	30	10,530	30	10,500	40	16,960
E5.	4 days x 2 Petty Off/Dept	16	5,648	12	4,212	12	4,200	16	6,784
E6.	2 days each Underway OOD	12	4,236	12	4,212	12	4,200	12	5,088
E7.	5 days x 2 per Cutter	10	3,530	10	3,510	10	3,500	10	4,240
E8.	5 days x GMC, GM3(2)	15	5,295						
E9.	10 days x GM, FT	20	7,060						

* Cost: If half the crew is trained per day, then any combination of these courses contributing to that half will cost the sum of the amounts indicated.

TABLE E5-11. TRAINING AVAILABILITY COURSE COST ALLOCATION

Course Description/Loading	WHEC		WMEC		WLB/WAGO		WAGB	
	M/D	Cost*	M/D	Cost*	M/D	Cost*	M/D	Cost*
A1. 5 days x Repair Party Personnel	50	17,650	50	17,550	50	17,500	50	21,200
A2. 2 days x All Watch Officers	6	2,118	6	2,106	6	2,100	6	2,544
2 days x 30% of crew	92	32,617	40.8	14,321	31	10,850	96	40,704
A3. 2 days x 30% of crew	92	32,617	40.8	14,321	31	10,850	96	40,704
A4. 5 days x Repair Party Personnel	50	17,650	50	17,550	50	17,500	50	21,200
A5. 2 days x One Man per Repair Party	6	2,118	6	2,106	6	2,100	6	2,544
A6. 1 day x Repair Party Personnel	10	3,530	10	3,510	10	3,500	10	4,240
A7a. 2.5 days	7.5	2,648	7.5	2,633			7.5	3,180
A7b. 5 days	15	5,295	15	5,265			15	6,360
A8. 2 days x One Man per Repair Party	6	2,118	6	2,106	6	2,100	6	2,544
B1. 5 days x CIC team	50	17,650						
B2. 5 days x MK56 team	50	17,650						
B3. 5 days x 5"/38 Gun Crew	50	17,650						
B4. 1 day x ASW and CIC teams	15	5,295						
C1a. 1 day x 2 ASAC's	2	706						
C1b. 3 days x 2 SASC's	6	2,108						
C2. 5 days x CO	5	1,765						
C3. 10 days x XO & Ops Officers	20	7,060						
C4. 10 days x CO & XO	20	7,060						
C5. 10 days x Ops Officer	10	3,530						
C6. 5 days x 7 ST's	35	12,355						
D1. 5 days x CO	5	1,765						
D2. 5 days x CO	5	1,765						
D3. 10 days x CIC Officer	10	3,530						
D4. 10 days x RD2 & RD3	20	7,060						
D5. 10 days x RDC/RD1	10	3,530						
D6. 1 day x RDC/RD1	1	353						
D7. 10 days x EW Officer	10	3,530						
E1. 3 days x PCO	0	0					3	1,272
E2. 2 days x LTJG/ENS	2	706	2	702			2	848
E3. 5 days x CO	5	1,765	5	1,755			5	2,120
E4. 10 days x 2 Petty Off/Dept	40	14,120	30	10,530	30	10,500	40	16,960
E5. 4 days x 2 Petty Off/Dept	16	5,648	12	4,212	12	4,200	16	6,784
E6. 2 days each Underway OOD	12	4,236	12	4,212	12	4,200	12	5,088
E7. 5 days x 2 per Cutter	10	3,530	10	3,510	10	3,500	10	4,240
E8. 5 days x GMC, GM3(2)	15	5,295						
E9. 10 days x GM, FT	20	7,060						

* Cost: If half the crew is trained per day, then any combination of these courses contributing to that half will cost the sum of the amounts indicated.

TABLE E5-12. DIRECT COST FACTORS FOR TRAINING AVAILABILITY

Element	WHEC	WMEC	WLB/ WAGO	WAGB	Remarks
A. Average one-way transit time to nearest FTC	21 hrs	30 hrs	37 hrs	48 hrs	
B. Cost of fuel	$43/hr	$17/hr	$9/hr	$50/hr	
C. Crew complement undergoing training	77	34	26	80	50% of crew is trained each day
D. Dockage fee	$150/ day	$150/ day	$150/ day	$150/ day	
E. Vehicle/transportation	$25/ day	$25/ day	$25/ day	$25/ day	
F. Total transit cost	$1806	$1020	$666	$4800	2A x B
G. Total days allocated to training	14	7	7	7	
H. Total dockage cost	$2100	$1050	$1050	$1050	D x G
I. Total vehicle transportation cost	$350	$175	$175	$175	E x G
J. Total direct cost	$4256	$2245	$1891	$6025	F + H + I
K. Direct cost per man day of training	$3.95	$9.43	$10.39	$10.76	J ÷ C x G

TABLE E5-13. REFRESHER TRAINING

Element	WHEC 378	WHEC 327	WMEC	WLB/ WAGO	WAGB	Remarks
A. Number of cutters in Comm FY76	12	5	22	31	6	Total 76
B. Average crew allocation per ship	154	136	68	46	160	
C. Total crew allocation/cutter type	1848	680	1496	1426	960	A x B
D. Average number of cutters/type undergoing REFTRA per year	10.67	2.33	13.0	9.67	1.33	Average total cutters undergoing REFTRA = 37.0
E. Average number of crewmen in REFTRA per year	1643	317	884	445	213	B x D
F. Total REFTRA days (FY75)	256	33	169	97	28	D x G
G. Average total REFTRA days per cutter (FY75)	24	14	13	10	21	Based on FY75 actuals
H. Actual training days (G-Sat/ Sun) per cutter type	18	10	10	8	15	
I. Total actual training days per cutter type	192	23	130	77	20	H x D
J. Average transit time(days) co REFTRA per vessel, FY75	4.4	4.2	2.6	4	4	Based on FY75 actuals
K. Daily average fuel/maintenance cost per cutter day (based on 180 day operating year)	$2916	$2551	$1376	$647	$3598	FY75 actuals + 10%
L. Depreciation per cutter operating day	$7407	$3703	$3333	$2462	$11100	Based on 180 operating day-year
M. Ammunition cost per cutter REFTRA	$68609	$44859	$426	$92	--	FY75 actuals + 10%
N. Ammo cost per cutter REFTRA day	$2416	$2465	$27	$7	--	M ÷ (G + J)
O. Average direct cost per cutter REFTRA day	$5332	$5016	$1403	$654	$3598	K + N

TABLE E5-13. (continued)

Element	WHEC 378	WHEC 327	WMEC	WLB/ WAGO	WAGB	Remarks
P. Average annual operating cost of cutter	$2.16M	$1.80M	$936K	$726K	$2.58M	FY74 actuals + 20%
Q. Average daily total cost per operating day	$19407	$13703	$8533	$6495	$25433	P ÷ 180 + L
R. Personnel allowance per cutter	154	136	68	46	160	
S. Direct cost per training man-day	$55	$67	$32	$25	$37	OX (G+J) ÷ H x R
T. Average total cost per training man-day	$199	$183	$196	$247	$265	(G+J) x Q ÷ H x R

E5.5 ASWEX COST

ASWEX training is used to provide readiness training for Navy exercises. Near Continuous Condition III watches and the accelerated pace of operations result in the need to augment the 378 crew with 15 additional men. These men allow the ship to maintain continuous two section Condition III watches while steaming in a task force.

This training is conducted by the Navy with between 8 and 11 ships participating with actual underway time of 10 days for the exercise. Table E5.14 provides a cost analysis of the ASWEX for the 378 only. The fundamental assumptions for this sort of analysis are the same as those used in developing the cost for REFTRA with the additional burden of the added fuel for gas turbine operation resulting in consumption increasing to 16,000 gallons/day as opposed to the 3,000 gallons/day for normal operation.

The fundamental assumption is that the crew all receives 100% training for the 8 hours they are on duty per day. This approach is the same that has been used for the REFTRA exercises, which considering the size of the ASW crew participation in the exercises is more than optimistic.

TABLE E5-14. ASWEX (378's)

ELEMENT	FUNCTION	REMARKS
A. Number of Cutters	12	378 only
B. Average Crew	169	154 + 15 = 169 Supplemented crew for ASW
C. Total Crew Allocation	2,028	A x B =
D. Number of Days/Ship	19	10.0 days underway training 4.5 days work up 4.5 days transit 19.0 days total
E. Total Ship Days	228	19 x 12
F. Total Man Days	38,532	2,028 x 19
G. Additional Fuel Due to Turbine/Ship	$ 54,960	16,000/day on turbine vs. 3,000/day normal; i.e., $43 x 16/3 = $229/hr $229/hr x 10 days x 24 hours = $54,960
H. Additional Fuel All Ships	$659,520	G x A
I. Transit Fuel/Ship	$ 4,644	4.5 days x 24 hr/day x $43/hr = $4,644
J. Transit Fuel All Ships	$ 55,728	I x A
K. Total Fuel Cost	$715,248	H + J
L. Depreciation per Cutter Operating Day	$ 7,407	Based on 180 operating days per year
M. Training Man Days	1,690	10 x 169
N. Average Daily Cost	$ 19,407	See REFTRA analysis
O. Daily Cost for Added Crew	$ 937	$16.25K/yr x 15 / 260 days/yr =

TABLE E5-14.

(Continued)

ELEMENT	FUNCTION	REMARKS
P. Training Daily Cost for Added Fuel	$ 4,464	(229 - 43) x 24 = Eliminate the fuel cost contained in Q.
Q. Daily Average Fuel Maintenance Cost	$ 2,916	Fiscal Year 75 Actuals + 10%
R. Average Daily Cost per ASW Training Day	$ 27,724	N + O + P + Q
S. Number of People Trained/Day	169	All trained
T. Average Total Cost per Training Man Day	$ 164	All trained 8 hours/day
U. Average Total Cost per Hands-On Training Man Hour	$ 20.50	T ÷ 8

E5.6 TRAINING AFLOAT COSTS

There is no easy approach to the allocation of cost for on-the-job training. The best approach uses one of the outputs from the questionnaire. The questionnaire shows that in the opinion of the officers, 44.08% (Questions 14 & 15) of the crew could not readily be expected to complete all tasks within the duty assignment. We should then assumes that they are being trained.

Based on using 180 operating days for a WHEC, the cost per operating day has been established at \$19,407 per day. If we assume that 44.08% of the crew is in training and they can be trained one-half the time, then the cost per student hands-on training hour with the 154 man crew is:

$$\frac{\$19,407}{154} \times .44 \times 1/2 = \$27.72$$

*U.S. GOVERNMENT PRINTING OFFICE : 1977 0-732-053/178